



Governor's Task Force on Wild Rice

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Convened by:

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Executive Summary

In May 2018, Governor Mark Dayton called for the formation of the Governor’s Task Force on Wild Rice¹ and charged it with finding creative ways to address the regulatory, economic, and scientific challenges associated with protecting wild rice. Although a water quality standard to protect wild rice has been a contentious issue in Minnesota, the Task Force found much to agree on in its three months of meetings. Members agreed on the importance of protecting wild rice and clean water, ensuring the viability of all Minnesota communities, respecting Tribal sovereignty, the need to address biological, chemical, and hydrological threats to wild rice and sharing the burdens and benefits of any solutions the state develops.

Task Force Recommendations

Task Force recommendations take into consideration:

- the complexities of wild rice, the Clean Water Act, the role of sulfate in wild rice health, and sulfate treatment technology,
- the wide variety of factors that impact wild rice health including biological, chemical, and hydrological factors, and
- the significance of wild rice to Minnesota Tribal Nations.

The central recommendation of the Wild Rice Task Force is to establish an interdisciplinary, collaborative and inclusive steering structure charged with developing recommendations for policies and practices that will enable wild rice to thrive in Minnesota. Given the extraordinary complexity of the subject matter and the short timeline for the Task Force, Task Force members felt they would be remiss to make final recommendations on some complex areas of the topic without additional efforts and voices. Nonetheless, in laying out the purpose, membership, structure and responsibilities of this body, along with several additional recommendations, the Task Force has created a roadmap to enable progress on the five areas identified in Executive Order 18-08.²

All recommendations in this report were achieved through consensus—the agreement that while imperfect, the set of recommendations articulated here set Minnesota on a surer course to assuring that wild rice thrives in Minnesota than the alternative paths.

1. **Create a wild rice steering structure**—To guarantee that sufficient attention and resources are dedicated to wild rice, the Task Force recommends creating and funding a Wild Rice Stewardship Council. The council members would represent a wide range of interests and perspectives, and be charged with making interdisciplinary recommendations on the management, monitoring, outreach,

¹ Refer to Appendix D: Executive Orders.

² Refer to Appendix D: Executive Orders.

research, and regulation regarding wild rice. The Wild Rice Stewardship Council will be tasked with the following:

- a. General responsibilities
 - b. Recommending a statewide standardized monitoring program
 - c. Recommending a comprehensive, statewide management plan
 - d. Fostering research on wild rice
 - e. Advising on statewide outreach and education
 - f. Developing a roadmap for protecting wild rice from sulfate
2. **Expand and support Tribal consultation**—The Legislature should pass a law which would permanently require the state to conduct Tribal consultation and to conduct Tribal-State relations training and to fund these activities. The new governor should renew Executive Order 13-10³ (on Tribal consultation and training) and hire at least one full-time Tribal liaison.
 3. **Promote sulfate minimization**—The Minnesota Pollution Control Agency (MPCA) should develop guidance for water permit holders on how to minimize sulfate in water discharges.
 4. **Improve MPCA variance process**—MPCA should work to improve the effectiveness, efficiency, and clarity of the variance process and decrease the time it takes to receive a variance.
 5. **Provide Point Source Implementation Grants for sulfate**—The Point Source Implementation Grant program funds local government’s water infrastructure projects to meet requirements that protect water quality. The Legislature should amend the program so funding can be used to reduce sulfate discharges
 6. **Initiate an annual wild rice week**—The Governor and Tribal Chief Executives should declare the first week of September Wild Rice Week and conduct activities to raise awareness of the value of wild rice.
 7. **Invest in wild rice**—The Legislature should appropriate adequate resources to achieve the above recommendations.

³ Executive Order 13-10, “Affirming the Government-to-Government Relationship between the State of Minnesota and the Minnesota Tribal Nations: Providing for Consultation, Coordination, and Cooperation” Rescinding Executive Order 03-05,” August 8, 2013, <https://mn.gov/gov-stat/images/EO-13-10.pdf>.

What the Task Force Considered

The Task Force utilized a structured consensus building approach designed and facilitated by the Office for Collaboration and Dispute Resolution at the Bureau of Mediation Services. Elements of the consensus building process included:

- interviews with representatives of governments, stakeholders, and Task Force members to identify goals and priorities for Task Force work;
- brief training on interest based problem solving;
- co-development and use of a process agreement;⁴
- co-development and use of guiding principles;⁵
- investment in relationship building; and
- structured dialogue to build shared understanding and options for mutual gain.

The Task Force reviewed extensive information and heard from experts in eight major topic areas to understand key scientific, regulatory, and cultural elements of this complex issue.

Regulatory Framework

Minnesota adopted a wild rice sulfate standard in 1973 to limit sulfate discharges to waters where wild rice grows, but questions arose that prompted a review of the standard and additional research into the effects of sulfate on wild rice. Its recent research findings prompted the MPCA to propose an equation-based standard as a revision to the existing wild rice standard. The agency drafted its proposal, solicited public comments, and sought scientific review in accordance with the formal rulemaking process. An administrative law judge reviewing the proposal disapproved of the revisions, and the agency withdrew the proposal in 2018. The 1973 standard is still in effect.

Cultures and Communities in Northern Minnesota

Both Minnesota Tribes and Northern Minnesota communities are concerned about how choices Minnesota makes regarding wild rice and water quality standards will affect their cultural survival. It is hard to overstate the spiritual, cultural, nutritional, and economic significance of wild rice (*manoomin/psij*)⁶ to tribal communities. The Ojibwe people received a prophecy to migrate westward to the place where “food grew up out of the water.”⁷ When the Ojibwe reached the western Great Lakes region and found wild rice, they made their home in the place that was prophesied. After they arrived, the Dakota people taught them harvest and gathering methods for this grain. They have been harvesting wild rice ever since, using the same traditional methods they

⁴ Refer to Appendix I: Process Agreement.

⁵ Refer to Appendix J: Guiding Principles for Identifying and Selecting Task Force Recommendations.

⁶ *Manoomin* is the Ojibwe word for wild rice. *Psij* is the Dakota word for wild rice.

⁷ Schuldt, Nancy et al., “Expanding the Narrative of Tribal Health: The Effects of Wild Rice Water Quality Rule Changes on Tribal Health Fond du Lac Band of Lake Superior Chippewa Health Impact Assessment,” Fond du Lac Band of Lake Superior Chippewa, 2018, <http://www.fdlrez.com/RM/downloads/WQSHIA.pdf>.

were taught. The significance of wild rice is especially important given the economic and health challenges and threats to cultural survival that are the legacy of centuries of oppression. At the same time, Northern Minnesota communities are grappling with economic decline in recent years including a loss of core services, job loss, out-migration, and food insecurity. Municipalities are also grappling with how to pay for wastewater treatment upgrades that may be needed to meet water quality standards, and have concerns about the necessity of these upgrades.

How Sulfate Affects Wild Rice

Most researchers agree that sulfate in water is converted to sulfide by bacteria in the sediment in which wild rice is rooted. As a general rule, as sulfide levels in the sediment increase, the likely presence of wild rice decreases. However, there are wild rice waters that do not fit this relationship where wild rice thrives. The rate at which sulfate is converted to sulfide, and how wild rice plants are affected, is an active area of scientific discussion. The MPCA proposed an equation that they believe accounts for key factors that impact sulfate to sulfide conversion in aquatic sediments, and helps determine the sulfate concentration for a water body that allows wild rice growth and regeneration. Other researchers have disagreed with this approach and think the equation does not sufficiently capture the dynamic biological, chemical, and hydrological relationships related to the effects of sulfate on wild rice. Some researchers believe the equation-based approach proposed by MPCA was over-protective of wild rice, and others believe it was under-protective.

Tribal-State Relations and Tribal Consultation Panel

Minnesota is home to eleven sovereign Tribal Nations. Much of the wild rice in Minnesota exists on Tribal reservations and treaty ceded territories (Treaties of 1837, 1854 and 1855). State projects and programs have broad impacts on Tribal communities and businesses, and state agencies engage with Tribes in a formal consultation process and in less formal contexts. Understanding the usufructuary rights granted to Tribes by federal treaties is critical to this work. Governor Dayton's Executive Order 13-10 led to the creation of Tribal-state relations training for state employees.⁸

Wild Rice Protection and Restoration

Historical data show wild rice has decreased in abundance in Minnesota. The Minnesota Department of Natural Resources (MNDNR) collaborates with several state and federal agencies, organizations and tribal governments to manage and protect wild rice through Wildlife Management Area acquisition and conservation easements. MNDNR activities include water level management and restoration on selected lakes, and regulation of harvest. Tribal Nations manage rice harvest within reservation boundaries. They also carry out or collaborate on wild rice management and monitoring activities within reservation boundaries and Treaty ceded territories. The 1854 Treaty Authority conducts ongoing monitoring of wild rice lakes in the Arrowhead region and various MNDNR

⁸ Executive Order 13-10, "Affirming the Government-to-Government Relationship between the State of Minnesota and the Minnesota Tribal Nations."

staff survey vegetation in lakes, including wild rice. Current MNDNR efforts are supported through license fees (\$40,000 per year) and game and fish funding.

Wild Rice Waters

Minnesota’s water quality standard to protect wild rice from sulfate applies to “water used for the production of wild rice” but does not define the phrase. To apply the standard, regulators need to know to which lakes, rivers, and streams it applies. At different times, and for different purposes, state agencies and tribal governments have created various lists of Minnesota waters that contain wild rice. As part of its rulemaking process, the MPCA proposed a list of about 1,300 bodies of water, gleaned from a variety of sources, where the proposed standard would apply.

Sulfate Treatment

Facilities that have permits to discharge treated water to lakes and rivers in Minnesota could be required to reduce sulfate in their discharges, if they are upstream from a wild rice water. MPCA-sponsored and independent research has shown that there are many challenges to removing sulfate from water. A recent MPCA-sponsored study evaluating 31 different treatment technologies, found that reverse osmosis is the currently available method nearest to being feasible, although biological and chemical treatments are in development. Reverse osmosis is hugely expensive to install, power, and maintain, which makes it impractical, particularly for municipal wastewater plants. “Brine”, a by-product of reverse osmosis treatment, presents additional challenges for treatment and final disposal which adds significant expense to sulfate removal. Minimizing sources of sulfate will be a feasible option for some facilities.

Water Quality Standard Variances

The MPCA evaluates cost considerations when it applies water quality standards in issuing permits. For example, if the agency finds that a municipal facility’s discharge has high sulfate levels but the cost of reducing sulfate in the discharge would lead to widespread social and economic effects, permitting-process tools (such as variances or schedules of compliance) can help address economic limitations. Variances are not a “free pass” to pollute and require the final approval of the United States Environmental Protection Agency (EPA). They are time-limited, require a justification to receive, and require a public review process. Variances could assist regulated facilities to bridge the gap until viable treatment technology and prevention options advance.

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Introduction

Wild rice (*Zizania palustris*) is a naturally occurring aquatic grass that once thrived throughout the state.⁹ Designated as the official state grain in 1977, it is woven into the fabric of Minnesota. Wild rice is harvested seasonally and supplements family incomes and nourishes communities. Wild rice wetlands provide habitat and food for waterfowl, fish, and wildlife. Minnesota has the largest concentration of wild rice remaining in the U.S.

Wild Rice is especially significant to Minnesota's Tribes who have harvested manoomin/psij¹⁰ for millennia¹¹ and depend on wild rice for cultural, economic, and physical well-being. The significance of manoomin/psij to Minnesota's Tribes goes beyond that: it is spiritual and sacred. Roughly 700 years ago, ancestors of the Ojibwe people received a prophecy to migrate westward from the Northern Atlantic Coast to the place where "food grew up out of the water."¹² Their migration journey followed the St. Lawrence River south and west through the Lower Great Lakes and then north and west to Lake Superior. When the Ojibwe people reached the western Great Lakes region and found wild rice, they decided to make this place their home.

The Governor's Task Force on Wild Rice¹³ was created in the summer of 2018 to help find creative solutions for protecting wild rice and addressing the regulatory, economic, and scientific challenges associated with that goal. The Governor charged the Task Force with providing a report in December 2018 (refer to Scope section below).

In the 1970s, a sulfate water quality standard to protect wild rice was put into law in Minnesota. Over the past decade, this standard has become a significant source of contention in our state, sparking heated discussion and intense scrutiny. The necessity and value of this regulation; the science supporting the regulation; the feasibility of enforcement; technological options for adhering to the standard; the implications for communities, tribes, wild rice harvesters and industry; and the requirements of the CWA have all been areas of debate in recent years. Numerous attempts to address these concerns—including rulemaking, legislation, and litigation—failed to reach a final resolution.

Underlying these debates are a set of very real concerns about how Minnesota communities and environments will fare in the coming decades. How do we set water quality standards to ensure that we have healthy ecosystems and clean water to sustain Minnesota communities and economies? How can we protect wild rice without creating undue hardship for communities already struggling with economic challenges? What are fair responsibilities to expect of Minnesota businesses and industries? Where should the state best invest its

⁹ Task Force discussions did not explicitly address cultivated wild rice.

¹⁰ *Manoomin* is the Ojibwe word for wild rice. *Psij* is the Dakota word for wild rice.

¹¹ Yost, Chad L. and Mikhail S. Blinnikov, "Locally diagnostic phytoliths of wild rice (*Zizania palustris* L.) from Minnesota, USA: comparison to other wetland grasses and usefulness for archaeobotany and paleoecological reconstructions," *Journal of Archaeological Science* 38, no. 8 (2011): 1977-1991.

¹² Schuldt, Nancy et al., "Expanding the Narrative of Tribal Health"; Warren, William W. and Theresa M. Schenk, *History of the Ojibway People, Second Edition*, St. Paul: Minnesota Historical Society Press, 1984.

<https://muse.jhu.edu/book/5404>; Benton-Banai, Edward, *The Mishomis Book*. Hayward, Wisconsin: Indian Country Communications, Inc. 1988.

¹³ Refer to Appendix D: Executive Orders.

resources to make an impact? Whose voices do and should have the most influence in these important decisions?

Across Minnesota, the answers to these questions are often portrayed in polarizing terms. However, throughout three months of intensive discussion, the Governor’s Task Force on Wild Rice found much to agree on, and specifically rejected framing the issue in oversimplified, polarizing narratives. There was clear consensus on the importance of protecting wild rice and clean water; ensuring the viability of all Minnesota communities; respecting Tribal sovereignty; and sharing the costs, burdens, and benefits of any solutions the state develops. Task Force members did not always see eye to eye on which path would be the most practical, effective, and equitable to achieve these shared goals. However, they made significant progress in developing a road map that Minnesota can use to advance this issue and set the stage for future program and policy development. They also laid a foundation of shared understanding and shared goals that they hope will set the tone for future discussions.

This report describes the charge and methods of the Governor’s Task Force on Wild Rice and presents consensus recommendations developed by Task Force members. The report does not attempt to capture the entirety of Task Force discussions nor the rich and complex history, science, and policy that surround this issue. Rather, it presents highlights meant to give readers background and context for the Task Force’s recommendations.

Executive Order Membership and Scope

Scope

On May 30, 2018 Governor Dayton signed Executive Order 18-08, which was superseded by Executive Order 18-09 on June 28, 2018. The executive orders created the Governor’s Task Force on Wild Rice to be convened by the Environmental Quality Board (EQB) with technical expertise and support from Department of Natural Resources (MNDNR) and MPCA.¹⁴ Due to the complexities of establishing the Task Force membership and executing the Executive Order, the first Wild Rice Task Force meeting was delayed until September 27, 2018. However, the scope of tasks originally contemplated in Executive Order 18-08 remained in effect.

Under a significantly compressed schedule, the Task Force on Wild Rice was charged with reviewing existing peer-reviewed scientific literature—both state sponsored and otherwise—, identifying information that is available to inform understanding of the impacts of sulfate or other sulfur compounds or habitat conditions on wild rice, identifying gaps scientific in literature, and making recommendations on priorities for wild rice research.

In addition, the Task Force was charged with answering the following questions in a report to Governor Dayton due December 15, 2018:

¹⁴ Refer to Appendix D: Executive Orders.

- Which water bodies used for producing wild rice should be added to or removed from the list of wild rice waters identified in Minn. R. 7050.0470, subpart 1¹⁵ and part 7050.0471 subparts 3 through 9 in the Revisor's draft of rules proposed by the MPCA dated March 16, 2018?
- What are the best management practices necessary for restoration and protection of natural wild rice stands?
- What is the condition of wild rice waters downstream of selected permitted wastewater dischargers?
- Are there any potential mitigating factors for wild rice to grow in waters with sulfate concentrations greater than 10 mg/L?
- What is the level of funding needed and sources of potential funding to support: data collection and research; restoration and protection activities; best management practices; sulfate minimization plans; and the development and installation of cost-effective sulfate treatment technologies?

Membership

The Executive Order called for the following membership,¹⁶ to be appointed by Governor Dayton:

- one representative nominated by the Minnesota Chippewa Tribe;
- one representative nominated by the four Minnesota Dakota Tribes, which include the Shakopee Mdewakanton Sioux Community, Prairie Island Indian Community, Lower Sioux Indian Community, and Upper Sioux Community;
- one representative nominated by Red Lake Nation;
- two independent scientists with expertise in wild rice research and plant-based aquatic toxicity;
- one non-native wild rice harvester;
- one representative from the ferrous mining industry;
- one representative from the non-ferrous mining industry;
- one representative from a municipal wastewater discharger;
- one representative of an electric utility;
- one representative of a statewide labor organization;
- two representatives from environmental nongovernmental organization; and
- one representative each from the Department of Natural Resources and the Minnesota Pollution Control Agency appointed by the commissioner of each entity to serve as an ex officio member.

Minnesota Chippewa Tribe

Executive Order 18-08¹⁷ called for one representative nominated by the Minnesota Indian Affairs Council (MIAC) and one representative nominated by the Minnesota Chippewa Tribe (MCT). MIAC is a state body that serves as

¹⁵ For the full text of the rule, refer to the website: <https://www.revisor.mn.gov/rules/7050.0470/>.

¹⁶ For a full list of Task Force Members, refer to Appendix A: Members of the Governor's Task Force on Wild Rice.

¹⁷ Refer to Appendix D: Executive Orders.

the formal liaison between Minnesota's federally recognized Indian Tribes¹⁸ and the state. MCT is a federally recognized Indian Tribe comprised of six Chippewa bands: Bois Forte, Fond du Lac, Grand Portage, Leech Lake, Mille Lacs, and White Earth.

MIAC issued Resolution 06142018_02¹⁹ expressing support for the Task Force, provided that each of the eleven Tribes represented by MIAC be provided a seat on the Task Force. Based on this feedback and the statutory limitation of Governor's Task Forces to fifteen members²⁰, Governor Dayton amended the order (now 18-09)²¹ to include one representative from the MCT, one representative of the four Minnesota Dakota Communities, and one representative of the Red Lake Nation. The Dakota Communities and Red Lake Nation subsequently appointed a member to the Task Force.

MCT declined to participate in the Task Force. In Resolution 107-18²² MCT explained that:

"the composition of the Governor's Task Force on Wild Rice does not respect the sovereignty of the eleven federally recognized Indian Tribes...does not acknowledge that Indian tribes will be disproportionately affected by the loss of a usufructuary property rights...and minimizes the technical expertise, knowledge, and interests of Indian tribes and the proposed Wild Rice Task Force composition directly relegates the Tribes to the status of special interest groups and industry rather than honoring Tribal sovereignty..."

In the resolution, MCT established the All Nations Wild Rice Task Force, which is composed of two representatives of each of Minnesota's eleven federally recognized Indian Tribes. MCT convened the All Nations Wild Rice Task Force in the fall of 2018 and intends to submit a report to Governor Dayton.

It is hard to overstate the significance of wild rice (manoomin/psiq) to tribal communities. Wild rice is spiritually, culturally, nutritionally, and economically significant. The Ojibwe people received a prophecy to migrate westward to the place where "food grew up out of the water."²³ When the Ojibwe reached the western Great Lakes region and found wild rice, they made their home in the place that was prophesied. After they arrived, the Dakota people taught them harvest and gathering methods for this grain. They have been harvesting wild rice ever since, using the same traditional methods they were taught. The significance of wild rice is especially important given the economic and health challenges and threats to cultural survival that are the legacy of centuries of oppression. Additionally, a significant portion of the wild rice in Minnesota is located within Ojibwe reservations or treaty ceded territory.

Given the significance of wild rice to the Ojibwe and its presence on their land, the Governor's Task Force on Wild Rice members were very concerned about proceeding without MCT participation. The Governor's Task

¹⁸ The four Dakota communities include: Shakopee Mdewakanton; Prairie Island; Lower Sioux; and Upper Sioux. The seven Ojibwe reservations include: Grand Portage; Bois Forte; Red Lake; White Earth; Leech Lake; Fond du Lac; and Mille Lacs.

¹⁹ Refer to Appendix F: Minnesota Indian Affairs Council Resolution.

²⁰ Minnesota Statutes 2018 §15.0593.

²¹ Refer to Executive Order 18-09 in Appendix D: Executive Orders.

²² Refer to Appendix E: Minnesota Chippewa Tribe Resolution.

²³ Schuldt, Nancy et al., "Expanding the Narrative of Tribal Health."

Force sent letters to each of the six Chippewa Tribes that are members of MCT expressing their desire to explore opportunities for collaboration, communication, and information sharing that would meet the needs of MCT.²⁴ The Task Force also sent a letter to the Governor's Office encouraging them continue to work with MCT leadership to develop a path for collaboration with the Governor's Task Force on Wild Rice.²⁵ Additionally, Task Force members directed the Task Force convener, EQB, to continue to reach out to MCT to let them know that the Task Force remained interested in collaboration.

While the Task Force received no formal response, it is the Task Force's understanding that MCT preferred to focus exclusively on the All Nations Wild Rice Task Force. However, the Governor's Office and MCT leadership met several times to attempt to address MCT's concerns. While there was agreement on the importance of the issues and the need to work together, the Governor's Office and MCT were not able to reach a resolution on the number of Tribal seats on the Task Force.

Task Force members endeavored to increase every member's knowledge about the Ojibwe lifeway and traditions through presentations on tribal history and Tribal-State relations by University of Minnesota Duluth Professor Tadd Johnson, the significance of wild rice by Fond du Lac Water Quality Specialist Nancy Schuldt, wild rice best management practices by Great Lakes Indian and Fish Wildlife Commission Wildlife Biologist Peter David, and identification of wild rice waters by 1854 Treaty Authority Resource Management Director Darren Vogt, among others. Task Force members recognize that these presentations were not a substitute for Tribal participation or consultation but a rather starting point for building a common understanding.

The Task Force articulated throughout their discussions that protecting manoomin/psij in Minnesota requires coordination and collaboration among all levels of government—federal, tribal, state, and local—and the participation of many stakeholder groups. Therefore, the Task Force's central recommendation is the creation of a Wild Rice Stewardship Council which would consist of representation from Minnesota's eleven Tribal Nations, as well as state government representatives, scientists, and stakeholders. It is the Task Force's avid hope that their proposed structure demonstrates respect for Tribal sovereignty and creates, at minimum, a starting point for Minnesota's Tribal Nations to discuss with the Governor and Legislature a coordinated and collaborative structure for working together to ensure that wild rice thrives in Minnesota.

Recommendations

All recommendations in this report were achieved through consensus. The recommendations below take into consideration:

- the complexities of wild rice, the CWA, the role of sulfate in wild rice health, and sulfate treatment technology;
- the wide variety of factors that impact wild rice health including biological, chemical, and hydrological factors; and
- the significance of wild rice to Minnesota Tribal Nations.

²⁴ Refer to Appendix G: Letter from Task Force on Wild Rice to MCT

²⁵ Refer to Appendix H: Letter from Task Force on Wild Rice to Governor Dayton.

The central recommendation of the Wild Rice Task Force is to establish an interdisciplinary, collaborative, and inclusive steering structure charged with developing recommendations for policies and practices that will enable wild rice to thrive in Minnesota. In laying out the purpose, membership, structure, and responsibilities of this body, along with several additional recommendations, the Task Force has created a roadmap to enable progress on the five areas identified in Executive Order 18-08.²⁶

1) Create and fund a wild rice steering structure to guarantee that sufficient attention and resources are dedicated to ensuring that wild rice thrives in Minnesota.

The Task Force recommends that the Legislature designate in statute and fund a Wild Rice Stewardship Council (here forward “the Council”) composed of government (state and tribal) and stakeholder representatives. The Council should be staffed by an executive director in order to guarantee that sufficient leadership, coordination, attention, and resources are dedicated to ensuring that wild rice thrives in Minnesota. The enabling statute should clearly articulate that it is in the public interest for the state to institute protective and restorative measures and be good stewards of natural lake and river wild rice for its ecological, cultural, and economic value.

Purpose

The Council would be an interdisciplinary steering group that integrates wild rice strategy and plans in order to facilitate the most effective outcomes and maximize resources utilized. It would play an integral role in depoliticizing complex wild rice issues and helping Minnesota's citizens, lawmakers, government staff, stakeholders, and wild rice managers make sound decisions regarding the stewardship of this unique resource. The Council will have the autonomy, responsibility, and authority necessary to develop policy recommendations to the Governor and executive branch of state government, Minnesota Legislature, tribal governments, and local governments. The Council would encourage the adoption of policies and practices that enable natural lake and river wild rice to thrive in Minnesota.

Membership

A central purpose of the Council is to foster leadership, collaboration, coordination, and communication among state and tribal government bodies and wild rice stakeholders. Therefore, the Council will strive to operate in a collaborative fashion and make decisions by consensus. In order to foster collaboration, members will work together with the assistance of a neutral facilitator to develop a principled operating agreement (including communication guidelines, guiding principles, roles and responsibilities, etc.) and shared vision to establish a fair, transparent, collaborative, and effective process. Council members will represent a wide range of interests and perspectives and include the following categories:

- State government

²⁶ Refer to Appendix D: Executive Orders.

- Tribal government
- Wild rice resource users
- National Pollutant Discharge Elimination System (NPDES) permittees
- Non-governmental organizations (NGOs)
- Research scientists and wild rice managers (with expertise in wild rice biology, ecology and management)
- Impacted local governments and communities

Tribal membership should include opportunity for all eleven federally recognized tribes in Minnesota to have representation and will be determined through government-to-government consultation between sovereign Minnesota Tribal Nations and the Governor’s Office. The Task Force on Wild Rice members encourage substantial tribal representation. Tribal representation on the Council is important, but it is not a substitute for formal government-to-government consultation.

Structure

In order to facilitate productivity and efficiency, the Council will utilize a committee structure. Committees may include Stewardship Council members and non-members with relevant subject matter expertise. Committees will be utilized for all technical topics (management, monitoring, research, etc.).

Adequate funding should be appropriated to support the responsibilities identified below including, but not limited to, member per diems and travel; executive director and staff member positions; a neutral, professional facilitator to assist with development of the Council and facilitate Council meetings as needed; and general operating expenses such as rent and supplies.

Responsibilities

The responsibilities of the Council include general responsibilities; recommending a statewide standardized monitoring program; recommending a comprehensive, statewide management plan; fostering research on wild rice; providing statewide outreach and education; and developing a roadmap to protect wild rice from sulfate.

a) General Responsibilities

- i) Further refine and carry forward the recommendations of the Governor’s Task Force on Wild Rice recommendations.
- ii) Provide the Governor, Chief Executives of Minnesota’s eleven Indian Tribes, and the Legislature with a biennial report on the health of wild rice and policy and funding recommendations to ensure that wild rice thrives in Minnesota.

b) Statewide Standardized Monitoring Program

A technical monitoring subcommittee shall:

- i) Recommend to MNDNR and MPCA a shared monitoring protocol, including biological (i.e. invasive species, diseases), chemical (i.e. sulfate, dissolved oxygen), and hydrological (i.e. water levels, groundwater hydrology) factors affecting wild rice in order to assess the health of wild rice populations over time. The protocol should draw on existing resources such as the Minnesota Sea Grant wild rice monitoring protocol, the MNDNR lake survey and vegetation mapping methodologies, and 1854 Treaty Authority's monitoring methodologies.
- ii) The monitoring program should be fully funded with a regular and ongoing appropriation. The Wild Rice Stewardship Council will make funding recommendations to the Legislature.
- iii) Develop recommendations to MNDNR, MPCA, and others on the implementation of the protocol. At their discretion, tribal governments may consider opportunities for implementing complimentary strategies and programs.
- iv) Report regularly on protocol implementation.

While monitoring is foundational to any effort to protect and restore any species, it is especially needed in the case of wild rice for two reasons. First, wild rice is an annual plant with populations that vary widely from year to year, with populations in lakes and rivers cycling through good, poor, and abundant years based on a wide array of ecological, hydrological, and climatic variables. Second, a lack of consensus and information about the impact of sulfate pollution on wild rice has contributed to the impasse about how to implement Minnesota's sulfate water quality standard. Selecting mutually agreed upon indicators of wild rice health (such as wild rice density, average stem height, water depth, stand area, number of potential seeds per stalk, presence of other plants co-occurring with wild rice, and relevant water quality information) and then collecting monitoring data measuring those indicators would increase clarity and a shared understanding of the impact of sulfate on wild rice populations.

While substantial data on the location of wild rice does exist, it is not yet complete. Data collected by different state agencies and units of government is not integrated. Therefore, an initial purpose and activity of the monitoring plan will be to integrate data which is currently tracked by different agencies and units of government including MNDNR, MPCA, and tribal governments (at their discretion) by using consistent measurements and methods and to develop a plan to complete the inventory.

Additional purposes of the monitoring program will be to track long-term trends in the presence and health of wild rice, the effectiveness of management and restoration efforts, and the impact of various stressors including sulfate, porewater sulfide, water levels, invasive species, disturbance, and others.

The monitoring plan should include opportunities to augment information gathering with existing sources of data collection, such as the MPCA's watershed monitoring and MNDNR's aquatic vegetation monitoring programs.

c) Comprehensive, Statewide Management Plan

A technical management subcommittee shall:

- i) Recommend to MNDNR a comprehensive, statewide wild rice management plan.
 - (a) At their discretion, tribal governments may consider opportunities for implementing complimentary strategies and programs on the waters they manage.

- (b) The plan will include clear goals and indicators, activities, timeframes, organizational responsibilities, and performance measures.
 - (c) Indicators of wild rice health should have the ability to be tracked over time to facilitate a better understanding of the impact of various stressors versus the natural variability of wild rice.
 - (d) The Council should work with Tribes to develop an understanding of natural wild rice variability through traditional ecological knowledge and lake histories.
 - (e) Biological, chemical, and hydrological factors will be considered.
- ii) Make funding recommendation to the Legislature. The management plan should be fully funded with a regular and ongoing appropriation.
 - iii) Develop recommendations to MNDNR and others on the implementation of the plan.
 - iv) Report regularly on plan implementation.

d) Foster research on wild rice

A technical research subcommittee shall:

- i) Identify and recommend research priorities and required funding levels. Prioritization should be given to needs identified through the monitoring protocol and management plans recommended by the Council. Topics of research may include:
 - (a) assessment of diverse factors impacting wild rice health and interaction among these factors;
 - (b) criteria and methodology for restoring wild rice within its historic range;
 - (c) seed development;
 - (d) impact of climate change;
 - (e) effective methods of controlling waterfowl predation, etc.; and
 - (f) roles of root plaques, hydrology, landscape context, etc.
- ii) Provide a forum for scientists and managers to convene and explore research needs, approaches, and outcomes for the purpose of building a shared understanding of the threats to and opportunities for fostering wild rice health and to fill data gaps.

e) Provide statewide outreach and education

- i) Develop a statewide education and promotion campaign to raise awareness about the ecological, nutritional, and cultural value of wild rice.
- ii) Coordinate an annual Wild Rice Week in which Tribal Chief Executives and the Governor declare the first week of September Wild Rice Week. Refer to Recommendation 6).
- iii) Additional outreach ideas include an annual “State of Wild Rice” conference, development of educational materials, education and engagement of restaurateurs, a multi-media campaign about the benefits and uniqueness of wild rice (perhaps in conjunction with Explore Minnesota), and an awareness campaign for lakeshore owners on lakes with wild rice. Consider existing education programs and opportunities through educational institutions such as tribal colleges and University of Minnesota.

- iv) Enforce natural wild rice labeling. Section/statute 30.49²⁷ requires specified labeling for natural wild rice. Raise awareness of the current labeling requirements for wild rice and develop an enforcement strategy for non-compliance.
- v) Explore ways to increase the number of businesses that process small batches of wild rice. Processing harvested green rice requires experience and special equipment. The number of businesses that process wild rice for harvesters is declining. Finding a wild rice processor is one of the biggest hurdles for folks who want to try harvesting. To increase recruitment of wild rice harvesters, the Council should explore ways to increase the number of businesses that processes wild rice for hand harvesters.

f) **Develop a roadmap for protecting wild rice from sulfate.**

Task Force members recognize that any regulatory path MPCA pursues has challenges and could face opposition, which could potentially mean ongoing uncertainty for the regulated community and insufficient protection for wild rice. Therefore, they recommend that the Wild Rice Stewardship Council develop a roadmap for protecting wild rice from harmful levels of sulfate, and other stressors, and recommend use of the roadmap to MPCA.

The Task Force encourages the Wild Rice Stewardship Council to build on lessons learned during MPCA's 2017-2018 rule making process, the consensus-building efforts of the Governor's Task Force on Wild Rice, and efforts of the All-Nations Task Force. Governor's Task force members believe that the holistic approach of the Wild Rice Stewardship Council—addressing the sulfate water quality standard in tandem with enhanced monitoring, management, and education efforts—will lead to better protection of wild rice and more strategic use of state and community resources.

Task Force members coalesced around the idea of developing a structured approach toward listing waters, as well as potential implementation of the sulfate standard, that would maximize protection of wild rice while limiting the scope and extent of burdens to Minnesota communities caused by the difficulty of treating sulfate. The complexity of the issue and the short timeline for the task force prevented the Task Force from fully developing a structured approach. However, key points from the Task Force discussions are described below for further contemplation by the members of the Wild Rice Stewardship Council.

Summary of key discussion points

The Task Force discussed two main ways of potentially structuring an approach to listing waters and implementing the standard – one based on whether the waters were impacted by dischargers and one based on the characteristics of the waters themselves.

- i) Task Force members discussed that not all wild rice waters have sulfate dischargers upstream, and not all dischargers will be impacted by a sulfate water quality standard. Therefore, it would make

²⁷ Minnesota Statutes 2018 §30.49.

sense to consider listing these “non-discharger” waters as a priority, in order to ensure there would be not future impacts to wild rice from sulfate.

The MPCA proposed approximately 1,300 wild rice waters as waters to which a standard would apply and they identified a list of approximately 1,000 additional waters that they proposed to track. However, they estimated that only about 250 to 350 of the 1,300 waters are downstream of a permitted discharger (at any distance). The Task Force noted that this is only about 20 percent of the total number of waters. Determining how many dischargers impact those waters is complicated because some dischargers may impact more than one receiving water and any given receiving water may be impacted by more than one discharger.

Nonetheless, MPCA estimated during the rulemaking that there are 128 dischargers that are located 25 miles or less upstream from a wild rice water on their proposed list. The 25 miles threshold is not a regulatory one, but simply an estimate of which dischargers were most likely to be impacted by the proposed rule. Of these dischargers some are municipal and some are industrial. Of the industrial dischargers some are large scale (i.e. mines) and other are small scale (i.e. gravel pits, glass plants). Some of the smaller dischargers (and even possibly some of the larger ones) may not discharge enough sulfate to cause or contribute to an exceedance of a standard. MPCA would need to conduct or require monitoring to determine which dischargers would need to lower their sulfate discharge through source reduction and/or installation of treatment technologies.

Based on this information, the Task Force discussed the following framework. A key note on this framework is that the members of the Task Force hold differing opinions on the sulfate standard and the listing of waters, with which this discussion is deeply entwined. The Task Force recommends the Wild Rice Stewardship Council consider:

- (a) Reviewing lists of wild rice waters (MPCA’s proposed waters, MNDNR’s updated 2018 inventory, 1854 Treaty Authority list of wild rice waters and other lists). For these waters, the Council should identify waters that do not have a NPDES discharge, and evaluate whether MPCA should place a priority on promulgating these waters, in rulemaking, as wild rice waters.
- (b) Identifying waters that do have a NPDES discharge (MPCA’s proposed waters, MNDNR’s updated 2018 inventory, 1854 Treaty Authority list of wild rice waters, and other lists) and fund MPCA to conduct the needed testing to determine whether the dischargers are contributing to sulfate and/or sulfide levels that are not protective of wild rice. If sulfate discharges are not contributing to sulfate and/or sulfide levels that are not protective of wild rice, consider whether to treat those waters as described in (a) above (Reviewing lists of wild rice waters), above.
- (c) Provide remaining dischargers—those who do contribute sulfate and/or sulfide to wild rice beds in a potentially harmful manner—a clear and reasonable timeframe and structure for improvement and protection of the wild rice beds (simultaneous to or prior to listing receiving waters as wild rice waters). This could include:
 - (1) identification and implementation of sulfate mitigation options
 - (2) piloting the use of biological, chemical precipitation, or other emerging sulfate treatment options
 - (3) monitoring to track sulfate and/or sulfide levels, wild rice bed health, and impact over time
 - (4) state investment in treatment development

- (5) ask facilities that receive variances to contribute funds for state-run research in pursuit of affordable treatment options for sulfate, or other strategies
 - (6) monitoring to identify non-sulfate stressors (chemical, biological, hydrological, and physical)
 - (7) management to address and potentially reduce or eliminate those non-sulfate stressors
 - (8) identification of potential non-wild rice waters where discharge could be diverted
- ii) Recognizing the inherent value of all wild rice waters, another element of a structured approach to implementation that the Task Force considered was identifying opportunities to immediately begin protecting some of Minnesota’s wild rice waters, while developing guarantees for continuing to make progress on protecting, managing, and restoring wild rice waters throughout the state.

The Wild Rice Stewardship Council could consider:

- (a) The Council could start its work by reviewing the MNDNR Wild Rice Working Group’s list of 350 wild rice waters, developed as part of MNDNR’s management priorities which is based on the number of acres of wild rice (40 or more); the number of harvester trips; and/or for having exceptional cultural, ecological, or wildlife value (as identified by members of the Working Group).²⁸ This list, or a similar approach, could be useful for the state to prioritize resources toward protecting these wild rice waters from chemical, biological, and hydrological stressors.
- (b) Minnesota could prioritize investment in waters which are on the MNDNR’s list of 350 waters which do have facilities discharging sulfate at levels that may not be protective of wild rice. Investment could include state resources, piloting sulfate treatment, monitoring, management, and other creative solutions.
- (c) The Stewardship Council could also review available information on MPCA’s proposed waters, MNDNR’s updated 2018 inventory, 1854 Treaty Authority list of wild rice waters, and other lists and make a recommendation of the list of waters and recommend to MPCA how to move forward with any necessary standard implementation for these waters including variances and treatment options. The Council recommendations on standard implementation should include how to manage these waters in a way that accounts for the various wild rice stressors.
- (d) Review available information and make a recommendation on the waters or types of waters that should be considered potential wild rice waters. This could include waters on the MPCA’s “insufficient information” list, other lists, or the appropriate conditions to support wild rice (temperature, depth, substrate, flow). The Council would provide a recommendation to MPCA on if/when/how a sulfate standard would apply in these waters—potentially through development of a “trigger” mechanism.

²⁸ “350 Important Wild Rice Waters in Minnesota,” Minnesota Department of Natural Resources, 2010.

2) Expand and support Tribal consultation.

- a) The Legislature should act on MIAC Resolution 0823 2017-02²⁹ by passing a law which would permanently require the state to conduct Tribal consultation and to conduct Tribal-State relations training and to fund these activities.
- b) The new governor should renew Executive Order 13-10, directing state government agencies to implement Tribal consultation policies aimed at improving relationships and collaboration with Minnesota's eleven Tribal Nations.³⁰
- c) State agencies should continue Tribal-State Relations Training for state government staff.
- d) The Governor's Office should employ at least one full-time tribal liaison, who would focus exclusively on Tribal consultation.
- e) The Governor's Office should have consistent government-to-government consultation with Tribes on wild rice.

3) Develop guidance and encourage the use of sulfate minimization plans.

MPCA staff should develop guidance and templates for sulfate minimization plans. Sulfate minimization plans could be stand-alone documents or, more likely, part of the required schedule of compliance activities that are included in a variance.

4) Improve effectiveness and efficiency of MPCA variance process.

MPCA should work to improve the effectiveness and efficiency of the variance process, in coordination with EPA and in compliance with the CWA, to clarify the variance process and decrease the time it takes to receive a variance (refer to Variance section on page 56). This work should include:

- a) Developing an approach for municipalities that streamlines information gathering and determining eligibility. This could include revising the existing chloride tool,³¹ developing a multi-discharger variance, or other creative tools;
- b) Working to develop a more easily understandable approach to determining the level of economic impact that would result in an industrial facility being eligible for a variance;
- c) Developing a framework for the schedule of compliance activities included in the variance (which may include a sulfate minimization plan) and needed to meet the highest attainable condition; and

MPCA staff should work closely with the EPA in developing this approach, in order to ensure (to the extent possible) that EPA is able to approve variances.

²⁹ Refer to Appendix F: Minnesota Indian Affairs Council Resolution.

³⁰ Executive Order 13-10, "Affirming the Government-to-Government Relationship between the State of Minnesota and the Minnesota Tribal Nations."

³¹ "Chloride reports and guidance documents," Minnesota Pollution Control Agency, last revised November 27, 2017, <https://www.pca.state.mn.us/water/chloride-reports-and-guidance-documents>.

5) The Legislature should amend the current Point Source Implementation Grant Program to include sulfate.

The Point Source Implementation Grant (PSIG) program provides grants to units of local government to assist with the cost of water infrastructure projects necessary to:

- a) meet wasteload reductions prescribed under a total maximum daily load (TMDL) plan required by Section 303(d) of the federal CWA.³²
- b) reduce the discharge of total phosphorus to one milligram per liter (mg/L) or less.
- c) meet any other water quality-based effluent limit established under Minnesota Statute Section 115.03, subd 1, (e)(8),³³ that is incorporated into a permit issued by MPCA that exceeds secondary treatment limits.
- d) meet a total nitrogen concentration or mass limit that requires discharging ten mg/L or less at a permitted design flow.³⁴

The program was most recently revised to include grant funding for advanced treatment at municipal facilities to comply with stringent mercury discharge limits into the Great Lakes Basin. In all likelihood, a water quality-based effluent limit for sulfate would require advanced wastewater treatment. But few water quality based limits for sulfate are currently in permits, and there are none for local governments.

The PSIG program should be amended to allow grants to reduce the discharge of sulfate, and grants should be allowed for sulfate reduction projects undertaken at drinking water plants or at other point sources in the municipal wastewater collection system that ultimately impact the discharge of sulfate from a wastewater treatment plan.

6) Initiate an annual wild rice week.

The Governor and Tribal Chief Executives should declare the first week of September Wild Rice Week. During this week MNDNR should waive the license fee for adults taking youth out ricing and extend ricing hours to sunset, Tribal Chief Executives and the Governor could rice together (analogous to Governor attending opening of fishing or hunting seasons), and Tribes could provide education on harvesting wild rice, finishing rice, etc.

7) Invest in wild rice.

The Task Force recommends investing in wild rice at a level commensurate with the value Minnesotans place on the resource. Nearly all of the recommendations listed above will require significant financial resources. It is essential that adequate resources be appropriated to support these recommendations. The Task Force recommends a four-pronged approach:

³² Clean Water Act of 1972, 33 U.S.C. §1251, Sec. 303(d), (1972).

³³ Minnesota Statutes 2018, §115.03, subdivision 1e (8).

³⁴ "Point Source Implementation Grants," Minnesota Department of Employment and Economic Development, last updated June 19, 2018, <https://mn.gov/deed/pfa/funds-programs/point-source-grants.jsp>.

- a) Wild Rice Stewardship Council shall create an inventory of new and existing funding sources, and establish a system to track the use of money spent on wild rice research, protection, management, and restoration.
- b) Develop new, long-term, sustainable funding stream(s) from the general fund and other sources based on the needs articulated in these recommendations.
- c) Encourage the use of funding sources such as the Legislative Citizen Commission on Minnesota Resources (LCCMR) and the Lessard-Sams Outdoor Heritage Council for wild rice protection, management, research, and restoration activities through priority setting in the grant making process, and guidance to entities seeking funding for wild rice protection and restoration efforts.
- d) Build upon existing resources such as MNDNR’s Shallow Lakes program, as well as MPCA’s citizen science monitoring program.

What the Task Force Did and Learned

The following sections summarize the major topic areas covered in Task Force discussions. Given the time limitations of the Task Force, this summary information is not exhaustive—it does not include all perspectives or literature relevant to the protection of wild rice. However, it does provide a shared narrative of many of the key elements—scientific, regulatory, and cultural—of this complex issue. The “Further readings” sections give recommended readings on each of the topic areas. These references were recommended by Task Force facilitators and were not necessarily read and deliberated on by Task Force members.

Regulatory Framework

Understanding the Issue

Minnesota’s water quality rules contain a unique water quality standard to protect wild rice from adverse impacts of sulfate. The standard is unique for several reasons:

- Minnesota’s lakes and rivers support the largest remaining, naturally occurring wild rice stands in the United States and wild rice (*Zizania palustris*) is found only in the upper Midwest;
- wild rice plays a key spiritual and cultural role in Ojibwe, Dakota, and other tribal traditions; and
- it is very rare to have a water quality standard that protects a single species.

The standard is part of the suite of Minnesota’s water quality standards that have been adopted by the state (MPCA) and approved by the federal government (EPA). Understanding the basics of water quality standards is important to understanding the status of the existing sulfate standard and the process that Minnesota must follow to change water quality standards.

Prior/Current Work

The MPCA initially promulgated a rule creating a water quality standard to protect wild rice from the impacts of sulfate in 1973. The standard applies to “water used for production of wild rice” and limits sulfate to 10 mg/L in

those waters. The sulfate standard was based on research done in the 1930s and 1940s that found that higher levels of sulfate in water correlated with reduced presence of wild rice.

The next set of wild rice-related rule changes occurred in 1998 when the MPCA adopted new rules governing water quality standards for Great Lakes Initiative (GLI) pollutants in the Lake Superior Basin. The 1998 rulemaking included a narrative standard pertaining to selected wild rice waters and designated 22 lakes and two river segments located in the Lake Superior Basin as selected wild rice waters.

The underlined text below shows the language added in 1998:

The numeric and narrative water quality standards in this part prescribe the qualities or properties of the waters of the state that are necessary for the agriculture and wildlife designated public uses and benefits. Wild rice is an aquatic plant resource found in certain waters within the state. The harvest and use of grains from this plant serve as a food source for wildlife and humans. In recognition of the ecological importance of this resource, and in conjunction with Minnesota Indian tribes, selected wild rice waters have been specifically identified [WR] and listed in part 7050.0470, subpart 1. The quality of these waters and the aquatic habitat necessary to support the propagation and maintenance of wild rice plant species must not be materially impaired or degraded.

The existing wild rice narrative and numeric sulfate standards have had limited implementation since their promulgation. Over time, the MPCA received questions about whether the 10 mg/L sulfate standard was necessary and how it should be implemented. Questions were raised as to exactly what constitutes “water used for production of wild rice,” and when and where the standard applies. Largely in response to these concerns, the Minnesota Legislature in 2011 directed the MPCA to undertake further study and, as necessary, revise the wild rice standard.³⁵

Following the study period, in August 2017, the MPCA proposed revisions to the wild rice standard. The goals of the revisions were to: 1) revise the numeric standard to incorporate the latest scientific understanding of the impacts of sulfate; 2) clarify the beneficial use and which waters support the beneficial use; and 3) clarify what it means to meet or exceed the standard.

As required by Minnesota law, the proposed revisions were reviewed by an administrative law judge (ALJ). The judge, with concurrence of the Chief ALJ, disapproved the revisions in January 2018. As articulated in the ALJ report,³⁶ the main reasons for the disapproval were that the MPCA’s proposed equation-based standard was unconstitutionally vague, presumably because of the lack of data to immediately calculate the results of the equation for each waterbody. The ALJ also disapproved the list of wild rice waters, stating that waters contained on lists compiled by the MNDNR and 1854 Treaty Authority had already been designated as wild rice waters and that the MPCA should have included those as proposed wild rice waters. The MPCA provided additional

³⁵ Laws of Minnesota, 2011 1st Spec. Sess. ch. 4, art. 4, § 136.

³⁶ Minnesota Office of Administrative Hearings, “Report of the Administrative Law Judge In the Matter of the Proposed Rules of the Pollution Control Agency Amending the Sulfate Water Quality Standard Applicable to Wild Rice and Identification of Wild Rice Rivers, Minnesota Rules parts 7050.0130, 7050.0220, 7050.0224, 7050.0470, 7050.0471, 7053.0135, 7053.0205, and 7053,” January 10, 2018, <https://www.pca.state.mn.us/water/protecting-wild-rice-waters>.

information to the ALJ and Chief ALJ in March 2018, arguing for the equation-based standard and disputing the judge's characterization of the designation of the wild rice waters. However, the Chief ALJ upheld the disapproval in April 2018. The MPCA then withdrew the proposed revisions, and changes have not been passed into law.

Task Force Process

At the first meeting of the Task Force, members were presented information about how water quality standards work under the CWA. They heard from Dave Pfeifer, Katharine Marko, and Barbara Wester with US EPA Region 5; Ed Fairbanks, Tribal Liaison for the Minnesota Department of Transportation; Catherine Neuschler, Minnesota Pollution Control Agency; and Stan Ellison, retired, previous Director of Lands and Resources for Shakopee Mdewakanton Sioux. These presentations were designed to help the Task Force understand the regulatory framework by giving members an introductory overview of water quality standards and a history of Minnesota's sulfate standard.

Information Presented

Under the CWA, states and authorized tribes are given the primary responsibility for developing and adopting water quality standards for surface waters.³⁷ EPA has oversight authority to ensure that water quality standards are consistent with the CWA and other federal regulations. States and tribes *must* submit their water quality standards to EPA for approval. A submittal includes the technical information underpinning the water quality standard, demonstration that there has been a public hearing and public comments, and certification that the standard has been adopted under state law (in Minnesota, this is usually through the state rulemaking process, which includes the public hearing and comment component). EPA works extensively with states and tribes in advance to provide technical assistance and advice on any issues that might prevent a state-adopted standard from being approved by EPA.

Once EPA approves a standard, it becomes federally enforceable and can only be revised through the water quality standards process laid out in federal rule. Should a state seek to revise a standard, as Minnesota has done with the sulfate standard through both legislation and rulemaking, the revised water quality standard must be submitted to EPA for review and approval. According to EPA:

"The submittal requirements include among other things, the methods and analyses conducted to support the water quality standards revisions, including how the revised water quality criteria are sufficient to protect the designated uses. Federal regulations require that criteria be protective of a state's designated uses and EPA's approval is based, among other factors, on determining that there is a scientifically defensible basis for finding that the criteria are sufficient to protect designated uses."

³⁷ Tribes that have been authorized through treatment as a sovereign have authority for developing and adopting water quality standards within the bounds of their respective reservations.

Water quality standards have three components: 1) the designated or beneficial use, 2) the numeric or narrative criteria,³⁸ and 3) antidegradation. The first two components, the beneficial use and the numeric criteria/standard, are most important to the wild rice sulfate discussion.

The designated or beneficial use is a description of how the state or tribe wants to use the specific waterbody. Minnesota's rules reflect seven different use classes:

- Class 1: Drinking water
- Class 2: Aquatic life and recreation
- Class 3: Industrial use and cooling
- Class 4: Agricultural and wildlife use
- Class 5: Aesthetics and navigation
- Class 6: Other uses
- Class 7: Limited resource value

The wild rice sulfate standard is part of Class 4, specifically Class 4A. The regulations state that “[t]he quality of class 4A waters of the state shall be such as to permit their use for irrigation without significant damage or adverse effects upon any crops or vegetation usually grown in the waters or area, including truck garden crops.”³⁹ The sulfate standard specifically applies in a subsection of these waters, known as “waters used for production of wild rice”. One key area of discussion at the wild rice task force is what waters should be protected by the wild rice beneficial use.⁴⁰

In order to protect the beneficial use—to be sure that the water is clean enough to be used as intended—the state sets a criteria or standard. Narrative standards are simple statements about what the water should be like, usually something like “the water shall be free from oil and grease”. Numeric standards are specific values that either indicate a maximum allowable amount of a pollutant (chloride, phosphorus, sulfate, etc.) that can be in the water while still protecting the beneficial use or set a minimum requirement of something (such as dissolved oxygen) which is needed to maintain the use. The current sulfate standard to protect wild rice is 10 mg/L.

One of the unique characteristics of the wild rice sulfate standard is that it is designed to protect a single species, rather than a broader class or community. Most of Minnesota's water quality standards around aquatic life, for example, articulate the beneficial use as the protection of “a healthy community of...fish and associated aquatic life and their habitats”.

In addition, wild rice is a very unique plant. It is an annual aquatic plant which germinates in submerged sediment, where it remains rooted throughout its 5- to 6-month life cycle. The stems and leaves of the plant grow to the water surface and float on the water surface for several weeks while roots develop, then the stem stands erect above the water surface, and finally the top-most, flowering and seed-bearing portion grows above the water. It is well known that wild rice is particularly susceptible to non-pollutant stressors, such as

³⁸ Note that while EPA refers to the narrative or numeric “criteria” as a component of the overall water quality standard, in Minnesota we call them narrative or numeric “standards”.

³⁹ Minn.R. 7050.0224.

⁴⁰ Refer to Wild Rice Waters.

hydrological changes, disturbances, and weather events, especially during the floating-leaf stage. This vulnerability makes it more difficult to isolate the impacts of a pollutant in the environment on wild rice populations.

Finally, depending on how wild rice plants interact with air, water, and sediment, sulfate may have different effects on wild rice. Sulfate in the ambient water is the source of the sulfur component, which can diffuse into sediment, where it is turned to the harmful sulfide in the porewater depending on sediment characteristics. The equation-based standard proposed by MPCA was developed by looking at these biological and chemical relationships. However, the potential harm of sulfide is influenced by the availability of oxygen in the air and water, as well as other factors. In addition, uncertainties remain about the fate of sulfate during transport from a discharge point to a wild rice water. Concern over these uncertainties complicates the MPCA's ability to set a precise or bright line level of sulfate in the water that is safe (why the MPCA proposed an equation) and to have a single, clear level of sulfide in the porewater that is safe.

When EPA is reviewing a criteria or standard submitted by a state or tribe, they ensure that the standard is based on a sound scientific rationale and contains sufficient parameters (or pollutant-specific standards) to protect the designated use. They do not make a determination about whether a different criteria or standard (for example a higher numeric value than what is being proposed) would protect the designated use. A key area of discussion at the wild rice task force is what the appropriate level of that sulfate standard should be.⁴¹

Further Reading

- “Water Quality Standards.” Code of Federal Regulations, title 40 part 131 (2018). https://www.ecfr.gov/cgi-bin/text-idx?tpl=/ecfrbrowse/Title40/40cfr131_main_02.tpl.
- “Water Quality Guidance for the Great Lakes System.” Code of Federal Regulations, title 40 part 132 (2018). <https://www.ecfr.gov/cgi-bin/text-idx?SID=b1855d1d0ed73f3012fdef51ebd79278&mc=true&node=pt40.24.132&rgn=div5>.
- “Water Quality Standards 101 Documents.” US Environmental Protection Agency, last updated February 8, 2018. <https://www.epa.gov/wqs-tech/water-quality-standards-101-documents>.
- “Water Quality Standards.” Minnesota Pollution Control Agency. <https://www.pca.state.mn.us/water/water-quality-standards>.
- “Statement of Need and Reasonableness: Amendment of the sulfate water quality standard applicable to wild rice and identification of wild rice waters.” Minnesota Pollution Control Agency. July 2017. <https://www.pca.state.mn.us/sites/default/files/wq-rule4-15i.pdf>.

⁴¹ Refer to The Role of Sulfate on Wild Rice Health.

Cultures and Communities in Northern Minnesota

Understanding the Issue

Discussions about the sulfate water quality standard and the protection of wild rice raise existential fears about the future of Minnesota communities and environments, especially for Tribes and communities in Northern Minnesota. This also transfers to sportsmen and sportswomen, state-licensed wild rice harvesters, industry groups, clean water advocates, and others. The presence of existential fears often leads to passionate narratives and a breakdown of understanding and trust. This is well-documented in social science research and history. Task Force members expressed a strong desire to move beyond “for-or-against” narratives and build greater shared understanding about the needs and concerns of Minnesota Tribes, wild rice resource users, and communities. Developing effective policy and programs for protecting wild rice will require ongoing efforts to build bridges and understanding across political and cultural differences.

Prior/Current Work

Concerns about cultural survival for Minnesota Tribes and Northern Minnesota communities are not new. However, these concerns come to the forefront as Minnesota grapples with how to best meet the multiple needs and values that intersect water quality standards generally, and wild rice and the sulfate water quality standard specifically. Past discussions, such as during MPCA’s rulemaking process, have elicited passionate comments from people on all sides of the issue about how rule revision could affect their ways of life. The record of public comment demonstrates that while there are indeed strong differences in what Minnesotans view as the best path forward, there is also considerable common ground on many issues, including desires to be good stewards of water quality, to protect and insure the sustainability of wild rice, and to support the cultural and economic well-being of Minnesota communities.

Task Force Process

Task Force members heard a presentation from Nancy Schuldt, Water Projects Coordinator with the Fond du Lac Band of Lake Superior Chippewa about a Health Impact Assessment Fond du Lac completed in October 2018 in cooperation with the Minnesota Department of Health.⁴² Nancy also shared information from a recent report on the economic benefits for wild rice in Minnesota as well as Fond du Lac’s approach to water quality standards. Task Force members also heard presentations from David Lislegard, Mayor City of Aurora, and Steve Giorgi, Executive Director of Range Association of Municipalities and Schools, who spoke about the challenges faced by Iron Range communities and their views on how water quality standards impact their communities. While not directly presented to the Task Force on the day this topic was reviewed, on several occasions the Task Force discussed how important wild rice was to state licensed harvesters and their tradition of hand-harvesting wild

⁴² Schuldt, Nancy et al., “Expanding the Narrative of Tribal Health.”

rice. They also frequently discussed the critical role wild rice provides to aquatic fish and wildlife habitats, the fish and wildlife populations it supports, and the recreational opportunities wild rice provides.

Information Presented

According to Fond du Lac’s Health Impact Assessment, wild rice has many health benefits for Ojibwe people. American Indians experience poorer health outcomes relative to other populations.⁴³ Life expectancy for American Indians is 10 years shorter than Minnesota’s average, and twice as many American Indians are food insecure (25 percent) compared to other populations in Minnesota.⁴⁴ Hand-harvested wild rice is a traditional, nutrient-rich food that is freely available to tribal members. Harvesting, preparing, and sharing manoomin are all important ways that Ojibwe people connect to identity, customs, and place—connections that are critical for Ojibwe mental, emotional, and spiritual health.⁴⁵ In terms of the economic benefits of wild rice, a report by Earth Economics estimates that “for every 1 percent reduction in wild rice harvests, over 3,500 pounds of manoomin would have to be replaced in the Minnesota Ojibwe diet, a value of 39,000 dollars per year,” and “every 1 percent decrease in harvest results in a loss of 253,000 dollars in economic output and about 2 jobs in Minnesota.”⁴⁶

According to David Lislegard and Steve Giorgi, many Northern Minnesota communities have experienced economic decline in recent years including a loss of core services, such as grocery stores and pharmacies, job loss, out-migration, and food insecurity. Water quality treatment is expensive for small communities in terms of capital infrastructure investment and debt retirement and annual operation, maintenance and replacement costs. Small communities lack a large tax base and more importantly, adequate residential, commercial and industrial sewer rate payers, therefore, the means to afford treatment. The cost of replacing aging infrastructure and complying with new water quality standards is a significant burden, and local leaders are concerned about the aggregate impact of complying with multiple new standards. It is not just the cost of treatment that is worrisome: David and Steve also expressed concern about whether the significant costs for sulfate treatment would result in a benefit for wild rice when other factors are known to affect the resource. Both David and Steve expressed a desire to protect wild rice and Ojibwe ways of life and, at the same time, were concerned that a sulfate water quality standard would be unsustainably burdensome to Iron Range communities.

Following these presentations, Task Force members identified shared values, concerns, and fears they heard across all presenters. Task Force members emphasized that while Minnesota Tribes and Northern Minnesota communities are often pitted against one another in the rhetoric on wild rice, this is a vast oversimplification that does not do justice to the complexities of the issue nor to the common concerns across groups. Some of the commonalities Task Force members identified include:

- Appreciation of wild rice—its management and sustainability

⁴³ Ibid.

⁴⁴ Ibid.

⁴⁵ Ibid.

⁴⁶ Fletcher, Angela, Olivia Dooley, Johnny Mojica, and Jessie Martin, “The Food That Grows Out of the Water, The Economic Benefits of Wild Rice in Minnesota,” Earth Economics (requested by Fond du Lac Band of Lake Superior Chippewa), Tacoma, WA, 2018, <http://www.eartheconomics.org/all-publications/manoomin>.

- Passion for their community—the health of their community is very important
- Concern about the future of their communities
- Availability of healthy food and food security and sovereignty
- Concern that their voices weren't being heard
- Feeling that they follow a traditional way of life in a modern world
- Concern that officials or regulators do not address their concerns

Task Force members noted that, while not covered in the presentations, wild rice is also significant to state-licensed harvesters as well as hunters and anglers. It is a food source for waterfowl and fish and is integral to many of Minnesota's wild places and ecosystems.

Further Reading

- Drewes, Annette. "Sustaining a Ricing Culture: Harvest, distribution, and management of wild rice across the Upper Great Lakes." Doctoral Dissertation. 2008.
- Fletcher, Angela, Olivia Dooley, Johnny Mojica, and Jessie Martin. "The Food That Grows Out of the Water, The Economic Benefits of Wild Rice in Minnesota." Earth Economics (requested by Fond du Lac Band of Lake Superior Chippewa). Tacoma, WA. 2018. <http://www.eartheconomics.org/all-publications/manoomin>.
- Schuldt, Nancy, Jennifer Ballinger, Nikki Crowe, Wayne Dupuis, Kelly Emmons, Crystal Greensky, Emily Onello, Kristin Raab, Melissa Walls. "Expanding the Narrative of Tribal Health: The Effects of Wild Rice Water Quality Rule Changes on Tribal Health Fond du Lac Band of Lake Superior Chippewa Health Impact Assessment." Fond du Lac Band of Lake Superior Chippewa. 2018. <http://www.fdlrez.com/RM/downloads/WQSHIA.pdf>
- "Reports and Publications." Department of Iron Range Resource & Rehabilitation Board. Last updated 2018. <https://mn.gov/irrrb/media/reports-publications.jsp>.
- Norrgard, R., Drotts, G., Drewes, A., and Dietz, N. "Minnesota Natural Wild Rice Harvester Survey: A Study of Harvesters' Activities and Opinions." Minnesota Department of Natural Resources. Division of Fish and Wildlife. Management Section. 2007. p 136. https://files.MDNR.state.mn.us/fish_wildlife/wildlife/shallowlakes/wild-rice-harvester-survey-2007.pdf.

The Role of Sulfate on Wild Rice Health

Understanding the Issue

The role of sulfate and sulfide on wild rice health is an active area of scientific research in Minnesota. Scientific study over the last eight to ten years has resulted in important advances in understanding the complex biological, chemical, and hydrological processes that affect wild rice populations. However, scientific understanding of these processes continues to evolve, and the conclusions in peer-reviewed literature do not always align. This section of the report describes research findings related to the role of sulfate and sulfide on wild rice health, highlighting areas of agreement and disagreement in the science, and areas of ongoing study.

Prior/Current Work

The sulfate standard of 10 ppm (or 10 mg/L), set in 1973, is based on research and field work by Dr. John Moyle, done in the in 1930s and 1940s. In 1944, Dr. Moyle stated that “No large stands of rice occur in waters having a SO₄ content greater than 10 ppm, and rice generally is absent from water with more than 50 ppm.”⁴⁷ In a March 16, 1975 memo, he further clarified that “the 10 ppm limit was placed in the Criteria following a telephone call to me from...the P.C.A. inquiring about water quality and wild rice. I said that there were no large and important natural and self-perpetuating wild rice stands in Minnesota where the sulfate ion content exceeded 10 ppm.”⁴⁸

Between 1973 and the beginning of the MPCA’s wild rice study that began in 2011, there were two published investigations into the effect of sulfate on wild rice growth.⁴⁹ Both studies evaluated the effect of a range of sulfate concentrations in hydroponic experiments without the presence of organic matter that might facilitate the microbial conversion of sulfate to sulfide. Sulfide is a form of sulfur that is known to be toxic. It was acknowledged in both reports that sulfide is potentially toxic to wild rice (e.g., “There is the possibility that excess sulfate will accumulate in the sediments and under anaerobic conditions be reduced to hydrogen sulfide which, in sufficient concentration, results in the death of wild rice plants.”⁵⁰). In the decades before the MPCA wild rice study, researchers interested in aquatic plants other than wild rice accumulated considerable scientific knowledge on the effects of sulfide on many other wetland plants, as summarized in a review article by Lamers et al.⁵¹

Apart from the issue of sulfate and sulfide, an understanding of the other environmental requirements for good wild rice habitat developed and was summarized in the 2008 MNDNR report on wild rice and is shown in Table 1-6 of the MPCA’s Technical Supporting Document (TSD).⁵² Wild rice can be significantly affected by carp, geese, hydrologic changes, and competing native and invasive plant species.

Beginning in 2010, Minnesotans increasingly raised questions concerning the wild rice sulfate standard and its appropriateness. Was it needed to protect wild rice? Was it set at the right level? At this time, the MPCA began looking into these questions surrounding sulfate.

⁴⁷ Moyle, John B., “Wild rice in Minnesota,” *Journal of Wildlife Management* 8(3):177-184, 1944.

⁴⁸ Memo from Dr. John Moyle, Attachment to Memo from Carri Lohse-Hanson, dated March 19, 1987.

⁴⁹ Lee, P. and J.M. Stewart, “Impact of Sulfate Discharge on the Ecology of Wild Rice Stands at CBSES. Impact of sulfate discharge from the Clay Boswell Steam Electric Station on the Ecology of Wild Rice Stands in the Mississippi River,” Department of Botany, University of Manitoba, July 1978, 262 pp; Lee, P.F. and P.C. Hughes, “The Effects of Sulfate on the Early Development of Wild Rice,” Prepared for Wenck Associates, Lakehead University Environmental Laboratory, 49 pp.

⁵⁰ Lee, P. and J.M. Stewart, “Impact of Sulfate Discharge on the Ecology of Wild Rice Stands at CBSES,” pg 19.

⁵¹ Lamers, et al., “Sulfide as a soil phytotoxin—a review,” *Frontiers in plant science* 4 (2013): 268, <https://www.frontiersin.org/articles/10.3389/fpls.2013.00268/full>.

⁵² “Final Technical Support Document: Refinements to Minnesota’s Sulfate Water Quality Standard to Protect Wild Rice,” Minnesota Pollution Control Agency, August 11, 2018., <https://www.pca.state.mn.us/sites/default/files/wq-rule4-15n.pdf>.

As described in the MPCA's TSD,⁵³ "The MPCA began its investigation of the effect of sulfate on wild rice in 2010 by reviewing the scientific literature. After this initial evaluation, MPCA determined that additional studies were needed to better understand the effects of sulfate on the growth of wild rice. In early 2011, MPCA staff scientists prepared a draft research protocol that was designed to further investigate the effects of sulfate on wild rice. On May 9, 2011, MPCA sponsored a discussion of the draft research protocol that included 36 scientists with pertinent expertise (13 from the University of Minnesota, seven from federal agencies, six from Minnesota Tribes, five from the MNDNR, and five scientists with other affiliations). The scientists discussed the draft research protocol, which hypothesized that if sulfate is important in controlling the occurrence of wild rice, the active agent would be a result of bacterial conversion of the sulfate to hydrogen sulfide (H₂S) in the sediment where wild rice seeds germinate and grow."⁵⁴

"The 2011 Legislature provide[d] funding to research the effects of sulfate and other substances on wild rice. The research protocol was revised in response to the expert discussion, and finalized on November 8, 2011...Following a preliminary data collection effort in 2011, in 2012 the MPCA...contracted with groups of scientists at the University of Minnesota Duluth and Twin Cities campuses to undertake a study to better understand the effects of sulfate and other substances on wild rice. The MPCA study focused on collecting data on the relationship between sulfate, sulfide, and wild rice through three major parallel study components.

The three components of the MPCA-sponsored wild rice study each had a specific purpose and associated strengths and limitations (Table 1-1). The study was designed so that the individual components together provided a better understanding of the effects of sulfate on wild rice. The three major study components were:

- Field surveys of wild rice habitats to investigate physical and chemical conditions correlated with the presence or absence of wild rice, including sulfate in surface water and sulfide in the sediment porewater of the rooting zone.
- Controlled laboratory hydroponic experiments to determine the effect of elevated sulfate and sulfide on early stages of wild rice growth and development.
- Outdoor container (mesocosm) experiments using natural sediments to determine the multi-year response of wild rice and other variables to a range of sulfate concentrations in the surface water."⁵⁵

"Following the completion of the Wild Rice Sulfate Standard Study in December 2013, MPCA reviewed the results and developed a preliminary analysis of the research, which it then shared with stakeholders in March 2014. MPCA staff met with many partners and stakeholders, and continued to refine the analysis of the research based on comments received, review of additional literature and additional statistical analyses. The result of this effort was completion of the Analysis of the Wild Rice Sulfate Standard Study — Draft for Scientific Peer Review in June 2014. MPCA then contracted with Eastern Research Group, Inc. (ERG) to convene and facilitate a scientific peer review of the study and analysis...MPCA refined its analysis based on the peer review and Tribal and Advisory Committee feedback, and in March 2015 MPCA released a Draft Proposal for Protecting Wild Rice from Excess Sulfate."⁵⁶

⁵³ "Final Technical Support Document," MPCA, 2017.

⁵⁴ "Final Technical Support Document," MPCA, 2017.

⁵⁵ Ibid, pg 4.

⁵⁶ Ibid, pg 1 - 2; internal citations omitted.

After the March 2015 Draft Proposal, the MPCA released a draft TSD in July 2016 and a final TSD supporting the rule and Statement of Need and Reasonableness (SONAR) in 2017. The TSD provides the scientific basis of the MPCA's proposed equation-based standard to protect wild rice, developed based on the research and analysis described above.

Ultimately, the MPCA found that high levels of sulfide in the porewater—the water in the sediment where the wild rice roots—has an adverse impact on wild rice. Specifically, the MPCA determined that sulfide at levels above 120 µg/L has a detrimental effect on the presence and density of wild rice. They reported that the level of sulfide in the porewater is controlled by three factors: 1) the amount of sulfate in the overlying water, 2) the amount of organic carbon in the sediment, and 3) the amount of iron in the sediment.

While the MPCA-sponsored studies were being conducted, the Minnesota Chamber of Commerce sponsored two studies that were published in the peer-reviewed literature.⁵⁷ The 2014 study showed that sulfate is not toxic at levels encountered in Minnesota waters, a finding confirmed by the MPCA-sponsored work published by Pastor et al.⁵⁸ The Fort et al. (2017) study found that sulfide could be toxic at high concentrations rarely encountered in Minnesota.⁵⁹ Pastor et al. (2017), using a different experimental design found that sulfide was toxic to wild rice at much lower concentrations than those found by Fort et al. (2017), a difference that shows that experimental design can greatly affect results.⁶⁰

As the MPCA analyzed the field data collected by Amy Myrbo of the University of Minnesota, Ramboll offered an alternative analysis of the data.⁶¹ Ramboll suggested that the MPCA-proposed equation would be sufficiently protective of wild rice if it were changed in several ways, including changing the protective sulfide concentration from 120 ppb to 300 ppb.⁶² The MPCA considered the suggested changes in the TSD and outlined reasons for not accepting the suggestions.⁶³

Task Force Process

The Task Force heard from some key scientists and experts involved in the wild rice research, and their different perspectives on the impact of sulfate and sulfide on the health of wild rice. The presenters were Ed Swain,

⁵⁷ Fort et al., "Toxicity of sulfate and chloride to early life stages of wild rice (*Zizania palustris*)," *Environmental toxicology and chemistry* 33, no. 12 (2014): 2802-2809.

<https://setac.onlinelibrary.wiley.com/doi/abs/10.1002/etc.2744>; Fort et al., "Toxicity of sulfide to early life stages of wild rice (*Zizania palustris*)," *Environmental toxicology and chemistry* 36, no. 8 (2017): 2217-2226.

⁵⁸ Pastor et al., "Effects of sulfate and sulfide on the life cycle of *Zizania palustris* in hydroponic and mesocosm experiments." *Ecological Applications* 27, no. 1 (2017): 321-336.

<https://esajournals.onlinelibrary.wiley.com/doi/abs/10.1002/eap.1452>.

⁵⁹ Fort et al., "Toxicity of sulfide to early life stages of wild rice, 2017.

⁶⁰ Pastor et al., "Effects of sulfate and sulfide on the life cycle of *Zizania palustris*," 2017.

⁶¹ "Draft sulfate standard equation: Options and basis for improvements," Ramboll Environ (requested by Minnesota Pollution Control Agency), May 16, 2017, updated May 30 2017, 51 pp.

⁶² "Draft sulfate standard equation," Ramboll Environ, 2017.

⁶³ "Final Technical Support Document," MPCA, 2017, pages 63-66.

Minnesota Pollution Control Agency; Nate Johnson, University of Minnesota-Duluth; and Mike Hansel, Barr Engineering (emeritus). The presenters talked about the areas of scientific research and study on wild rice that have resulted in general agreement and consensus and those where disagreement remains, and how those areas of disagreement resulted in different reactions to/opinions on the MPCA's proposed sulfate standard.

Information Presented

Researchers agree that sulfate has little-to-no direct impact on wild rice. Hydroponic studies funded by the Chamber of Commerce and conducted by Fort Labs found that early-stage wild rice plants “were not adversely affected” by sulfate concentrations up to 5,000 mg/L.⁶⁴ Another hydroponic study by Pastor et al. found no effect of sulfate on seed germination and that sulfate concentrations of 1600 mg/L only slightly affected root growth.⁶⁵

Instead, the pollutant that impacts wild rice is sulfide in the sediment porewater. Researchers generally agree that high sulfide concentrations in the porewater are toxic to wild rice. Sulfide is a known toxin, and some researchers believe that sulfide can hinder the plant's ability to take up nutrients, such as nitrogen.⁶⁶ The MPCA-sponsored experiments and data analysis resulted in the MPCA determining that 120 µg/L of sulfide is a protective level. This does not mean that levels of sulfide above 120 µg/L will result in the death of wild rice but that there are adverse impacts above that level, while levels below are generally safe for wild rice growth and health.

The MPCA came to the proposal of 120 µg/L using multiple lines of evidence. Field surveys conducted by Myrbo et al. proposed that the presence or absence of wild rice in 108 water bodies in Minnesota were largely determined by porewater sulfide concentration, water clarity, and water temperature and that wild rice density is significantly correlated with lower sulfide.⁶⁷ Separate hydroponic studies by Pastor et al. observed that wild rice stem, leaf, and total plant mass were reduced by 60-75 percent in sulfide concentrations of 320 µg/L.⁶⁸ Task Force members discussed whether the roots and seeds of wild rice were not affected by sulfide in those experiments.

Pastor et al. (2017) also found that sulfide concentrations in the upper 10 centimeters of sediment (porewater) were highly correlated with concentrations of sulfate concentrations in the water above.⁶⁹ In mesocosms, the correlation between sulfate and sulfide were so strong that they could use one concentration to calculate the

⁶⁴ Fort et al., "Toxicity of sulfate and chloride to early life stages of wild rice," 2014.

⁶⁵ Pastor et al., "Effects of sulfate and sulfide on the life cycle of *Zizania palustris*," 2017.

⁶⁶ Pastor et al., "Effects of sulfate and sulfide on the life cycle of *Zizania palustris*," 2017.

⁶⁷ Myrbo et al., "Sulfide generated by sulfate reduction is a primary controller of the occurrence of wild rice (*Zizania palustris*) in shallow aquatic ecosystems." *Journal of Geophysical Research: Biogeosciences* 122, no. 11 (2017): 2736-2753, <https://esajournals.onlinelibrary.wiley.com/doi/abs/10.1002/eap.1452>.

⁶⁸ Pastor et al., "Effects of sulfate and sulfide on the life cycle of *Zizania palustris*," 2017.

⁶⁹ Ibid.

other.⁷⁰ Wild rice populations grown in mesocosms exposed to sulfate levels of 250 mg/L or more went extinct after five years.⁷¹

However, there is not general agreement on the level of sulfide wild rice can tolerate. Researchers and those engaged in discussion about the wild rice sulfate standard have drawn different conclusions from the field studies, lab experiments, and mesocosm studies.

Hydroponics research sponsored by the Minnesota Chamber of Commerce found the sulfide concentration of 963 µg/L would be adequate to protect wild rice.⁷² However, in that study the leaves of just-germinated seedlings were allowed access to oxygen in the atmosphere, and MPCA researchers are unsure whether these specific findings could be used to generalize what happens in nature.⁷³ Others noted that additional research conducted by Fort Laboratories on this topic is forthcoming.

Different conclusions are also drawn by those looking at the field data. The 1854 Treaty Authority claims a noticeable decline in wild rice presence can be observed in the Myrbo field data at sulfide levels between 60-70 µg/L.⁷⁴ Myrbo et al. found that the median sulfide concentration at field sites where wild rice was present was 88 µg/L.⁷⁵ Others have noted that there are sites (five cultivated rice paddies and 10 natural waterbodies) with concentrations of sulfide greater than 120 µg/L and dense wild rice. There are also disagreements among researchers about the statistical approaches used to analyze field data.

Researchers in John Pastor's group at the University of Minnesota have continued to study wild rice in mesocosms. Some early interpretation of the results of that work was provided by John Pastor in a 2016 memo to the Fond du Lac environmental department. Dr. Pastor said he had observed a black plaque on the roots of wild rice plants that were subjected to 50 mg/L of sulfate or more.⁷⁶ Dr. Pastor identified the black plaque as iron sulfide and deduced that it must have been the product of the bonding between iron and sulfide.⁷⁷ With this information, he conducted additional experiments that found that adding iron to the sediment had no statistically significant effect on wild rice and that plants grown under both sulfate and iron had lowest vegetative and seed production of all.⁷⁸

⁷⁰ Ibid.

⁷¹ Ibid.

⁷² "Technical Analysis of MPCA March 2015 Proposed Approach for Minnesota's Sulfate Standard to Protect Wild Rice," Prepared by Barr Engineering for the Minnesota Chamber of Commerce, 55 pp.

⁷³ MPCA Technical Support Document. 2017.

⁷⁴ 1854 Treaty Authority, letter to Minnesota Pollution Control Agency, September 6, 2016.

⁷⁵ Myrbo et al., "Sulfide generated is a primary controller of the occurrence of wild rice," 2017.

⁷⁶ John Pastor, letter to Fond du Lac Environmental Department, June 13, 2016.

⁷⁷ Ibid.

⁷⁸ Ibid.

A recent peer reviewed publication from Dr. Pastor's research group documented and discussed the findings that wild rice plants subjected to elevated sulfate can develop a black plaque on their.⁷⁹ There is general agreement that the black plaque is iron sulfide. However, there is discussion about whether the iron sulfide plaques are the cause of the observed harm to the wild rice plants, or a symptom of sulfide toxicity. The black plaques are formed because sulfide was produced by microbes from sulfate and interacted with natural iron in the sediment. LaFond-Hudson et al. (2018) concluded that the negative effects observed in the wild rice plants could either be the direct result of either elevated porewater sulfide or the black iron-sulfide (FeS) plaques that forms as a result of increased sulfate and sulfide: "FeS on roots may be a symptom of elevated porewater sulfide or further exacerbate its effects; our experiment was not able to distinguish between these possibilities."⁸⁰

Further Reading

- MPCA's Wild Rice Sulfate Standard Study Documents website, including peer review: <https://www.pca.state.mn.us/water/wild-rice-sulfate-standard-study>
- "Final Technical Support Document: Refinements to Minnesota's Sulfate Water Quality Standard to Protect Wild Rice." Minnesota Pollution Control Agency. August 11, 2018. <https://www.pca.state.mn.us/sites/default/files/wq-rule4-15n.pdf>.
- "Natural Wild Rice in Minnesota: A Wild Rice Study." Minnesota Department of Natural Resources. February 15, 2008. https://files.MDNR.state.mn.us/fish_wildlife/wildlife/shallowlakes/natural-wild-rice-in-minnesota.pdf.
- Fort, Douglas J., Michael B. Mathis, Rachel Walker, Lindsey K. Tuominen, Mike Hansel, Scott Hall, Robin Richards, S. R. Grattan, and Kurt Anderson. "Toxicity of sulfate and chloride to early life stages of wild rice (*Zizania palustris*)." *Environmental toxicology and chemistry* 33, no. 12 (2014): 2802-2809. <https://setac.onlinelibrary.wiley.com/doi/abs/10.1002/etc.2744>.
- Fort, Douglas J., Kevin Todhunter, Troy D. Fort, Michael B. Mathis, Rachel Walker, Mike Hansel, Scott Hall, Robin Richards, and Kurt Anderson. "Toxicity of sulfide to early life stages of wild rice (*Zizania palustris*)." *Environmental toxicology and chemistry* 36, no. 8 (2017): 2217-2226.
- LaFond-Hudson, Sophia, Nathan W. Johnson, John Pastor, and Brad Dewey. "Iron sulfide formation on root surfaces controlled by the life cycle of wild rice (*Zizania palustris*)." *Biogeochemistry* 141, no. 1 (2018): 95-106. <https://link.springer.com/article/10.1007/s10533-018-0491-5>.
- Lamers, Leon PM, Laura L. Govers, Inge CJM Janssen, Jeroen JM Geurts, Marlies EW Van der Welle, Marieke M. Van Katwijk, Tjisse Van der Heide, Jan GM Roelofs, and Alfons JP Smolders. "Sulfide as a soil phytotoxin—a review." *Frontiers in plant science* 4 (2013): 268. <https://www.frontiersin.org/articles/10.3389/fpls.2013.00268/full>.

⁷⁹ LaFond-Hudson, Sophia et al., "Iron sulfide formation on root surfaces controlled by the life cycle of wild rice (*Zizania palustris*)," *Biogeochemistry* 141, no. 1 (2018): 95-106, <https://link.springer.com/article/10.1007/s10533-018-0491-5>.

⁸⁰ LaFond-Hudson, Sophia et al., "Iron sulfide formation on root surfaces," 2018.

- Lee, P. and J.M. Stewart. "Impact of Sulfate Discharge on the Ecology of Wild Rice Stands at CBSES. Impact of sulfate discharge from the Clay Boswell Steam Electric Station on the Ecology of Wild Rice Stands in the Mississippi River." Department of Botany, University of Manitoba. July 1978. 262 pp.
- Lee, P.F. and P.C. Hughes. "The Effects of Sulfate on the Early Development of Wild Rice." Prepared for Wenck Associates. Lakehead University Environmental Laboratory. 49 pp.
- Pastor, John, Brad Dewey, Nathan W. Johnson, Edward B. Swain, Philip Monson, Emily B. Peters, and Amy Myrbo. "Effects of sulfate and sulfide on the life cycle of *Zizania palustris* in hydroponic and mesocosm experiments." *Ecological Applications* 27, no. 1 (2017): 321-336.
<https://esajournals.onlinelibrary.wiley.com/doi/abs/10.1002/eap.1452>.
- Ramboll. "Draft sulfate standard equation: Options and basis for improvements." May, 2017. 51 pp.

Tribal-State Relations and Tribal Consultation Panel

Understanding the Issue

Minnesota is home to eleven sovereign Tribal Nations. Much of the wild rice in Minnesota exists on tribal reservations and treaty ceded territories. Understanding Tribal-State relations, including treaty obligations to the Tribes, is important for developing meaningful policy and programs to protect wild rice.

Prior/current work

In 2013, Governor Dayton signed Executive Order 13-10: Affirming Government-to-Government Relationship between the State of Minnesota and the Minnesota Tribal Nations; Providing for Consultation, Coordination, and Cooperation; Rescinding Executive Order 03-05.⁸¹ The executive order required that identified cabinet-level state agencies develop and implement Tribal consultation policies, with all others working through the tribal liaison in the Governor's Office, to consult with each of the Minnesota Tribal Nations with the goal of achieving mutually beneficial solutions. It also directed cabinet-level agencies to designate a staff member to assume responsibility for implementation of the Tribal consultation policy and to provide training for designated staff who work with the Minnesota Tribal Nations to foster a collaborative relationship between the State of Minnesota and Tribal Nations.

Task Force process

The Task Force heard from speakers regarding Tribal-State relations: Dennis Olson, Executive Director, MIAC; Tadd Johnson, Professor, University of Minnesota Duluth; and Ed Fairbanks, Tribal Liaison for the Minnesota Department of Transportation.

⁸¹ Executive Order 13-10, "Affirming the Government-to-Government Relationship between the State of Minnesota and the Minnesota Tribal Nations."

Information presented

Dennis Olson from the MIAC gave a brief background of the council and its membership. He noted that it was established in 1963 as the first council of its type in the nation and serves as the official liaison between eleven Tribal Nations and the State of Minnesota. He showed the locations of Minnesota's Tribal Nations and the ceded territories established by the 1837 and 1854 Treaties, and highlighted the hunting, fishing, and gathering rights (usufructuary rights) guaranteed in these Treaties.

Tadd Johnson from the University of Minnesota Duluth gave an overview of Federal Indian Policy and the legal background between tribes and states. He began by defining two fundamental principles: sovereignty and trust responsibility. Sovereignty is the right and ability of a people to determine their own destiny, and trust responsibility are obligations owed by the United States to Indian Tribes through treaties, statutes, and the course of dealing. He went on to highlight significant dates in the history of American Indian and US relations and exclusions of states power including the Marshall Trilogy of court cases (1820s-1830s), the reservations and removal period (1800's), the Dawes General Allotment Act (1887), the Indian Reorganization Act (1934), and the Indian Civil Rights Act (1968), among other important dates.

Ed Fairbanks, Tribal Liaison for the Minnesota Department of Transportation provided background on Tribal-State relations and Tribal consultation. State projects and programs have broad impacts on Tribal activities and businesses. Executive Order 13-10 has opened lines of communications among state government and Tribal Nations, and helped build greater collaboration and understanding. Consultation with Tribes must be government-to-government at the commissioner or governor level and needs to be ongoing. It is necessary for state government to understand and recognize the rights granted to Tribes through treaties with the federal government. Executive Order 13-10 also led to the creation of Tribal-State Relations Training, which was developed through a collaboration between American Indians and state agencies, and has been important for helping state employees understand their relationship with tribal governments in their work.

Further reading

- Executive Order 13-10. "Affirming Government-to-Government Relationship between the State of Minnesota and the Minnesota Tribal Nations; Providing for Consultation, Coordination, and Cooperation; Rescinding Executive Order 03-05." August 8, 2013. <https://mn.gov/gov-stat/images/EO-13-10.pdf>.
- "Why Treaties Matter Exhibit." Clean Water, Land, and Legacy Amendment, Minnesota Humanities Center, Minnesota Indian Affairs Council and Smithsonian National Museum of the American Indian. <http://treatiesmatter.org/exhibit/>

Wild Rice Protection and Restoration

Understanding the Issue

Wild rice has decreased in abundance from the historical record, however, due to lack of funding, estimates of more recent declines are difficult to assess. Hand-harvested as a food source for more than a thousand years,

wild rice habitat also supports many fish and wildlife species, protects water quality, and contributes to Minnesota’s economy. The annual gathering of wild rice is a seasonal tradition, much like the fishing opener, for many residents of the state.

Tribal Nations manage lakes and the harvest of wild rice within reservation boundaries in Minnesota and they have their own scientific and management expertise to do so. The 1854 Treaty Authority monitors wild rice abundance on ten lakes annually, and inventory lakes with wild rice within the treaty ceded territory. The Great Lakes Indian Fish and Wildlife Commission (GLIFWC) monitors rice waters within the 1837 ceded territory. Management activities within the Treaty ceded territories often occurs in cooperation with the Minnesota MNDNR.

MNDNR collaborates with other government agencies in the protection, restoration, enhancement and ongoing management of wild rice. These agencies include the Minnesota Board of Water and Soil Resources (BWSR), the U.S. Fish and Wildlife Service (USFWS), the National Park Service (NPS), and the U.S. Forest Service (USFS), nongovernmental organizations, and tribal governments. Mandates are based on statutory responsibilities and departmental mission statements. See below for some statute examples. Also see “Statutes and Rules Relating to Wild Rice.”⁸²

84.091 AQUATIC VEGETATION IN PUBLIC WATERS.

Subdivision 1. Ownership. The state is the owner of wild rice and other aquatic vegetation growing in public waters. A person may not acquire a property interest in wild rice or other aquatic vegetation or destroy wild rice or aquatic vegetation, except as authorized under this chapter or section 103G.615.

84.028 COMMISSIONER OF NATURAL RESOURCES, SPECIFIC ASSIGNMENTS.

Subdivision 1. Commissioner to control department responsibilities. The powers, duties and responsibilities of the Department of Natural Resources relating to boat safety, firearm safety, wild rice harvest program, ginseng harvest program, and such other programs as are now or hereafter vested by statute in the Department of Natural Resources, shall be under the control and supervision of the commissioner of natural resources.

Prior/Current Work

Funding is the most limiting factor for state agencies to engage in wild rice protection and restoration. Annually, about 200 wild rice lakes are managed by MNDNR annually to increase wild rice abundance. Projects are often done in partnership with Tribes or local conservation organizations. Area wildlife management staff monitor rice, manage water levels, and complete additional work such as seeding and removing competing vegetation on wild rice lakes. Most of this wild rice work is done as part of the Area office’s annual budget with existing staff

⁸² “Statutes and Rules Relating to Wild Rice,” Minnesota Department of Natural Resources, Division of Fish and Wildlife, Management Section, 2018.

time, and not with extra funding. At times special projects are undertaken on specific lakes to manage or increase wild rice. These special projects often receive specific funding outside of the Area Wildlife budget.

From 2001 to the present, MNDNR has led a large-scale project to manage and maintain wild rice on 50 to 100 lakes by keeping the outlet channels clear of obstructions and free-flowing. For many years the work was done in partnership with Ducks Unlimited, which contributed funding and staff time to the project. The annual budget for this work has been \$60,000 for the last few years, and is primarily funded by state-issued wild rice harvester license sales.

There are several ongoing efforts to monitor wild rice. The 1854 Treaty Authority, Fond du Lac Band of Lake Superior Ojibwe, and MNDNR have collaborated on an aerial survey of wild rice lakes in Northeast Minnesota. Approximately 80 to 130 lakes have been surveyed every year since 2007. The MNDNR Shallow Lakes Program conducts lake surveys on 20 to 50 wild rice locations every year. The MNDNR Lakes Habitat Program and Section of Fisheries also conduct lake surveys annually, many on wild rice lakes. And in the last few years, the Lakes Habitat Program and Section of Fisheries have been working to map emergent vegetation on lakes across the state, including wild rice beds.

Efforts to increase protection of wild rice lakes have included WMA acquisition and have been ongoing. A special project to increase protection of wild rice lakes through conservation easements began in 2010. BWSR, Ducks Unlimited, MNDNR, and eight soil and water conservation districts were successful in gaining 60 conservation easements and four acquisitions on 30 lakes and rivers to protect wild rice through the Outdoor Heritage Fund. Currently, the project has been funded for five phases and has expanded to 12 counties.

Though funding is the primary limiting factor, there are other factors that limit wild rice protection and management. Some of these include not getting permission from private landowners to do work in outlets affecting rice lakes (such as removing beaver dam and other obstructions), lakeshore owners not in favor of water level management, and lakeshore owners not supporting wild rice seeding projects.

Task Force Process

Task force members heard from the following presenters:

- Peter David, Wildlife Biologist from the Great Lakes Indian Fish and Wildlife Commission on wild rice protection and ongoing restoration efforts in the ceded territories of Wisconsin (Treaties of 1837 and 1842).
- Dr. Alexander Kahler, Senior Scientist and Marketing Manager with Biogenetic Services, Inc. as well as a Molecular Genetics Consultant, with Informative Genetics and Genomics, LLC. Dr. Kahler spoke to the genetic diversity of wild rice in Minnesota and his work on developing a more inclusive data set for natural wild rice.
- Ray Norrgard, Wetland Management Specialist with the MNDNR and Gary Drotts, Task Force member and former MNDNR Wildlife biologist reviewed the practices used by the MNDNR to foster statewide wild rice growth on up to 200 lakes a year.

Information Presented

On a global scale, Minnesota is the center for wild rice (*Zizania palustris*), along with Ontario, Wisconsin, and upper Michigan. Of the states, Minnesota's lakes and rivers sustain the most abundant distribution, and contain important genetic diversity. The list of threats to wild rice is long and growing. Altered hydrology and invasive species are two well-known threats to wild rice. Loss of wild rice to geese and swan grazing is becoming more common in Minnesota as populations of these birds have increased over the last several decades. Climate change may already be having an impact with warmer summer nights potentially increasing the occurrence of brown spot, a fungus affecting wild rice seed production.

Restoring hydrology is very important to wild rice growth and much of Minnesota's efforts are aimed at lowering water levels through the maintenance of free-flowing outlets (e.g. beaver dam removal). Seeding (scattering seeds on lakes) is another technique to encourage wild rice growth, and works best in concert with other management techniques. In general, protecting and restoring wild rice is highly site-specific.

The site-specific nature of wild rice protection is due in part to the complex nature of the wild rice life cycle. Wild rice is an annual plant that is pollinated by the wind and reseeds each year. Seeds must be dormant in near-freezing water for at least three months to germinate, but they can stay dormant for many years. Wild rice plants prefer to grow in shallow water: roughly 0.5 to three feet deep. They grow in three- to five-year cycles, with wide variation in the number and density of plants in a given bed from year to year.⁸³ Harvesters and managers note that wild rice can be absent or nearly absent from a water body for multiple years and then develop dense stands again when the conditions are right. The cyclical nature of wild rice ecology makes it challenging to understand, and mitigate for, the threats to wild rice.

Further Reading

- "Natural Wild Rice in Minnesota: A Wild Rice Study." Minnesota Department of Natural Resources. February 15, 2008. https://files.MDNR.state.mn.us/fish_wildlife/wildlife/shallowlakes/natural-wild-rice-in-minnesota.pdf.
- Norrgard, R., Drotts, G., Drewes, A., and Dietz, N. "Minnesota Natural Wild Rice Harvester Survey: A Study of Harvesters' Activities and Opinions." Minnesota Department of Natural Resources. Division of Fish and Wildlife. Management Section. 2007. p 136. https://files.MDNR.state.mn.us/fish_wildlife/wildlife/shallowlakes/wild-rice-harvester-survey-2007.pdf.
- Statutes and Rules Relating to Wild Rice. 2018. Section of Wildlife, Minnesota Department of Natural Resources.
- Vogt, Darren J. "Wild Rice Monitoring and Abundance in the 1854 Ceded Territory (1998-2017)." Duluth, MN: 1854 treaty Authority, A (2018). <http://www.1854treatyauthority.org/management/biological-resources/fisheries/reports.html?id=124&task=document.viewdoc>.

⁸³ "Natural Wild Rice in Minnesota: A Wild Rice Study," Minnesota Department of Natural Resources, February 15, 2008, https://files.MDNR.state.mn.us/fish_wildlife/wildlife/shallowlakes/natural-wild-rice-in-minnesota.pdf.

- Kjerland, Tonya. “Wild Rice Monitoring Handbook.” The University of Minnesota Sea Grant Program. Publication #SH16. 2015. http://www.seagrant.umn.edu/coastal_communities/wildrice
- “Wild Rice Seeding Guidelines.” US Department of Agriculture. Natural Resource Conservation Service. Biology Jobsheet #14. 2004. https://efotg.sc.egov.usda.gov/references/public/MN/jobsheet-14_wild_rice_seeding_guidelines_644.pdf.

Wild Rice Waters

Understanding the issue

As described in the Regulatory Framework section, Minnesota’s water quality rules contain a unique water quality standard to protect wild rice from the adverse impacts of sulfate. The standard currently applies to “water used for production of wild rice”, but that phrase is largely left undefined. In order to effectively implement a water quality standard, there needs to be definition of where the standard applies. As an annual plant, wild rice production on a lake or river can vary greatly from year to year. This includes having no rice on a lake one year, followed by a year where the same lake appears to be completely covered in wild rice. Efforts are also ongoing for the restoration of wild rice in various waters across the state where former populations of wild rice have declined or disappeared.

Prior/Current Work

There are multiple lists of “wild rice waters” or waters that contain stands of wild rice. These lists have been compiled by different entities for different purposes.

MPCA

The existing wild rice sulfate standard refers to “water used for production of wild rice”, but no list accompanies that definition. In 1998, the MPCA added a narrative standard to protect wild rice to its rules; that narrative standard applies to “selected wild rice waters” and the rulemaking designated 22 lakes and two river segments located in the Lake Superior Basin as selected wild rice waters.⁸⁴ They are shown in the rules with the notation [WR]. According to MPCA and EPA, these 24 waters comprise the only current regulatory list of wild rice waters.

As part of the direction to MPCA to review and revise the wild rice sulfate standard, the Legislature directed the MPCA to “designat[e] waters containing natural beds of wild rice as waters subject to a standard”. In addition, the legislation states that “the commissioner of the Pollution Control Agency shall establish criteria for the waters...The criteria shall include, but not be limited to, history of wild rice harvest, minimum acreage, and wild rice density.”⁸⁵

⁸⁴ Minn. R. 7050.0224, Subp 1 and Minn. R. 7050.0470, Subp 1.

⁸⁵ Laws of Minnesota, 2011 1st Spec. Sess. ch. 4, art. 4, § 136.

During the process of developing and proposing revisions to the wild rice sulfate standard in accordance with the legislative directive, the MPCA developed a database of wild rice waters. Eventually the MPCA proposed about 1,300 waters as “Class 4D wild rice waters” to which the sulfate standard would apply.

MNDNR

The MNDNR first developed a list of wild rice waters in 1999. The intent of the list was to develop a basic inventory and compile information about the wild rice waters being managed.

In 2007, “the Minnesota legislature directed the Commissioner of Natural Resources to prepare a study for natural wild rice that includes: (1) the current location and estimated acreage and area of natural stands; (2) potential threats to natural stands, including, but not limited to, development pressure, water levels, pollution, invasive species, and genetically engineered strains; and (3) recommendations to the house and senate committees with jurisdiction over natural resources on protecting and increasing natural wild rice stands in the state.”⁸⁶ In response to the legislation, the MNDNR updated the 1999 inventory and compiled additional information as requested. The MNDNR completed this work in February 2008 and published a report titled *Natural Wild Rice In Minnesota: A Wild Rice Study document submitted to the Minnesota Legislature by the Minnesota, Department of Natural Resources*. The list of wild rice waters was included as Appendix B in the report.

Tribal

Tribal Nations manage the wild rice waters within their reservation boundaries in Minnesota. Tribes monitor wild rice waters both within their reservations and within the treaty ceded territories. This includes annual aquatic plant surveys monitoring health and density of the rice and seeding/restoration work to restore wild rice waters. Several Tribal Nations' wild rice programs also partner with their respective water quality programs to monitor sulfate or sediment within Tribal wild rice waters. The extent of data collected in each program differs according to each tribe. Tribal wild rice programs are funded either through Tribal general funds or awarded grants.

Two tribes in Minnesota—the Grand Portage Band and the Fond du Lac Band—have water quality standards for wild rice. Both Bands include wild rice as a cultural use, and include a list of Tribal waters including the designated uses for each waterbody. Both Bands have a numeric sulfate water quality standard of 10 mg/L. The 1854 Treaty Authority, which manages resources in the 1854 Ceded Territory, also conducts wild rice surveys and monitoring. The Treaty Authority maintains and regularly updates a list of wild rice waters and frequently provides that information to the MPCA and MNDNR. Other Tribes may also maintain lists of wild rice waters or growing locations within their reservations.

⁸⁶ Session Law 2007, Chapter 57, Article 1, Section 163; “Natural Wild Rice in Minnesota,” MNDNR, 2008, Executive Summary.

Task Force Process

At the October 26 Task Force meeting, members heard about how different lists of wild rice waters were developed. They heard from Catherine Neuschler, MPCA; Ray Norrgard of the MNDNR; Gary Drotts, task force member and former employee of the MNDNR; and Darren Vogt, Resource Management Division Director for the 1854 Treaty Authority. These presentations were designed to give an overview of how various existing lists of wild rice waters and locations were developed.

Information Presented

MPCA

The MPCA presentation covered how the MPCA developed the list of proposed Class 4D wild rice waters—those where the proposed sulfate standard would apply—and how the MPCA envisioned future revisions and updates to the list of waters covered by the standard.

The MPCA's goal was to develop a list of waters that demonstrated the wild rice beneficial use—use of the grain as a food source for wildlife and humans. In order to develop this list, the MPCA reviewed multiple sources of information on wild rice. The MPCA used a weight of evidence approach to identify waters where the beneficial use existed.

As a starting point, the MPCA reviewed the inventory of wild rice found in the MNDNR 2008 report, *Natural Wild Rice in Minnesota*.⁸⁷ That report looked at both current and historical information on wild rice. At the time that the MPCA was beginning its rulemaking process, the MNDNR report represented the most comprehensive and current inventory of wild rice locations available; however, as noted above, it was not designed to support the MPCA's rulemaking and has some limitations in its use for that purpose. Nevertheless, the MNDNR report served as the prime source for the MPCA's list.

The MNDNR report included 1,286 wild rice locations, including locations both on and off Tribal reservation land. The MPCA reviewed the acreage information available in the MNDNR report. A total of 777 locations included estimates of the amount of wild rice present.⁸⁸ The MPCA chose to begin developing its list of wild rice waters by including all waters in the MNDNR report that were described as having two or more acres of wild rice, assuming that this was sufficient rice to support waterfowl or potentially draw human harvesting.

For waters that had less than two acres or in which there was no acreage documented, the MPCA reviewed additional sources for corroborating evidence that would show that the water demonstrated the wild rice beneficial use. These additional sources included:

- MNDNR Wild Rice Harvester Survey Report (2007)
- Minnesota Wild Rice Management Workgroup List of 350 Important Wild Rice Waters (2010)
- 1854 Treaty Authority List of Wild rice waters (March 24, 2016)

⁸⁷ "Natural Wild Rice in Minnesota," MNDNR, 2008,

⁸⁸ In general, very little information is available about wild rice density.

- MNDNR Aquatic Plant Management Database
- MPCA Biomonitoring Field Sites
- University of Minnesota/MPCA Wild Rice Study Field Survey Sites (2011 – 2013)
- Minnesota Biological Survey Database (2011 and 2017)
- MPCA Call for Data (2013)
- MPCA Permittee Monitoring Reports

In many cases, these sources corroborated the evidence of wild rice provided in the MNDNR 2008 report, and the waters were added to the MPCA list. These sources also provided information about additional waters, which in some cases was sufficient to demonstrate that those waters also had enough wild rice to demonstrate the beneficial use. Those waters were then added to the MPCA's list. Two acres or more of wild rice did not have to be present or documented for the MPCA to include a water on the list of proposed Class 4D wild rice waters.

At the time that the MPCA withdrew the wild rice sulfate standard, they were proposing to include 1,251 lakes, wetlands, or stream reaches in rule as Class 4D wild rice waters. This final list of Class 4D wild rice waters did not include waters within the reservations of Leech Lake, Fond du Lac, or Grand Portage, at the request of those Bands. The proposed list of Class 4D wild rice waters included 950 of the 1,286 waters listed in the MNDNR 2008 report.

The MPCA maintains a complete database that includes 2,347 waters across Minnesota, including within the boundaries of Tribal reservations. The remainder of the waters, beyond those proposed as Class 4D wild rice waters, are maintained as "insufficient information" waters –waters where the MPCA does not have sufficient information to demonstrate that the beneficial use exists. A key reason for maintaining this list of insufficient information waters is to search for additional information to support potential future listing.

The MPCA planned that there would be additional listing of Class 4D wild rice waters to be covered by the wild rice sulfate standard in the future. In early discussions of the potential rule amendments, the MPCA considered a couple of different options of criteria for listing waters in the future. At first, the MPCA proposed listing any water that "contains a self-perpetuating population of wild rice plants, either currently present or that have been present in the given water body since November 28, 1975,"⁸⁹ looking at a minimum of 8,000 wild rice stems over the surface of a lake, wetland, or reservoir; or 800 wild rice stems over a river-mile. The MPCA later revised that to consider listing any lake, stream, or wetland with at least one of the following attributes:

1. a natural bed of wild rice of at least:
 - a. 0.25 acres in area with a stem density of at least 8 stems per square meter;
 - b. or 0.5 acres in area with a stem density of at least 4 stems per square meter; or
2. a documented history of wild rice harvest occurring after November 28, 1975.

Based on feedback from Tribes and stakeholders, the MPCA decided that a threshold approach was too prescriptive, and proposed simply having a process to ask for information to add waters during the every three years triennial standard review. In that process, MPCA would ask Tribes, wild rice harvesters, the MNDNR, stakeholders, and others to provide any information they had showing that the wild rice beneficial use exists in a

⁸⁹ "Draft proposal to protect wild rice from excess sulfate," Minnesota Pollution Control Agency, March 2015.

water not already on the MPCA’s list. The MPCA would propose to list any water with a history of human harvest or the presence of two acres of rice, and would review and consider other information that might demonstrate the beneficial use. The MPCA’s intent was to be broad about the type of evidence considered—oral histories, written records, photographs, field surveys, etc.

MNDNR

The MNDNR has not published any updates to its inventory completed in 2008. However, the MNDNR did respond to the MPCA’s 2013 call for data with information gathered from multiple sources within MNDNR, including lake surveys done by several MNDNR programs and wild rice observations reported by MNDNR staff. A total of 805 additional wild rice locations were identified and submitted to MPCA, and the MNDNR’s total list of all wild rice locations was updated to 2,091.

The MNDNR is continuing to work to update the inventory, removing duplicates and adding waters using data from several MNDNR programs as well as sources from outside the Department, including the U.S. Fish and Wildlife Service and Tribal information.

MNDNR intends to include a GIS layer when the updates are complete, which is expected in March 2019.

1854 Treaty Authority

The following passages from the 1854 Treaty Authority website describe survey and monitoring efforts in the 1854 Ceded Territory:

“The 1854 Treaty Authority has conducted wild rice surveys since 1996. The purpose of these ongoing surveys is to determine the presence of wild rice on lakes and rivers in the 1854 Ceded Territory. The 1854 Treaty Authority has compiled a list of wild rice waters within the 1854 Ceded Territory. This list of 512 lakes and river stretches serves as an inventory of rice waters, and as the foundation for the wild rice survey. During the survey, general information about each lake or river is also recorded to determine areas where habitat may be suitable for wild rice.

The survey has been coordinated with numerous partners including the Bois Forte, Grand Portage, and Fond du Lac reservations. A total of 314 different lakes and river stretches within the 1854 Ceded Territory [were] surveyed between 1996 and 2017.”⁹⁰

“The 1854 Treaty Authority initiated a wild rice monitoring program in 1998. When compared to the historic record, a decline in wild rice abundance seems apparent. However, no formal record exists and present trends are even less apparent. The wild rice monitoring program attempts to document wild rice abundance. Monitoring has been conducted on seven lakes in the 1854 Ceded Territory each year from 1998-2017. The monitoring program in 2002-2017 has included the same ten lakes and rivers.

⁹⁰ Vogt, Darren J, “Wild Rice Monitoring and Abundance in the 1854 Ceded Territory (1998-2017),” 1854 Treaty Authority, February 2018, <http://www.1854treatyauthority.org/management/biological-resources/fisheries/reports.html?id=124&task=document.viewdoc>.

Water depth and water temperature are tracked on each lake soon after ice out until late fall. Field measurements and water sampling for laboratory analysis are also conducted to obtain water quality information.

Surveys to estimate wild rice density are completed on each lake when the rice is standing and reaching maturity. Wild rice biomass is then calculated for each lake to compare success across years. A report entitled *Wild Rice Monitoring and Abundance in the 1854 Ceded Territory* (1998-2017) is available”.⁹¹

Further Reading

- “Natural Wild Rice in Minnesota: A Wild Rice Study.” Minnesota Department of Natural Resources. February 15, 2008. https://files.MDNR.state.mn.us/fish_wildlife/wildlife/shallowlakes/natural-wild-rice-in-minnesota.pdf.
- 1854 Treaty Authority Wild Rice Page. <http://www.1854treatyauthority.org/wild-rice/wild-rice.html>
- MPCA Wild Rice Waters Database. <https://www.pca.state.mn.us/document/wq-s6-43xlsx>.
- Information Sources Used to Develop the MPCA Draft List of Wild Rice Waters. <https://www.pca.state.mn.us/sites/default/files/wq-s6-43n.pdf>.

Sulfate Treatment

Understanding the Issue

Current and potential NPDES permit holders in Minnesota are concerned about additional capital and long term operation and maintenance costs of complying with a sulfate water quality standard. Given the current debate over an appropriate water quality standard and designation of “wild rice waters”, they are also concerned about whether immediate implementation of the current sulfate standard is the best use of limited resources. As of the date of this report, membrane treatment (reverse osmosis) technology is thought to be the most effective proven method for treating sulfate at the scale necessary to fully comply with potential permit limits. However, membrane technology has several challenges including high capital, operation and maintenance, large land area needed to install equipment, and energy costs relative to other treatment technologies. Also of concern is the high cost of treatment, increased energy use, and disposal of the concentrate “brine” that is a byproduct of the process. The viability of other treatment technologies, such as biological treatment and chemical precipitation, as well as the role of sulfate minimization plans are also active areas of discussion related to sulfate source reduction and treatment.

⁹¹ Vogt, Darren J, “Wild Rice Monitoring and Abundance,” 2018.

Prior/Current Work

In 2018, MPCA published a report titled *Analyzing Alternatives for Sulfate Treatment in Municipal Wastewater* which was prepared by Bolton & Menk, Inc and Barr Engineering Company.⁹² This report gives a comprehensive assessment of currently availability technologies for sulfate wastewater treatment. The report's conclusions are built upon the academic literature on sulfate treatment at the industrial and municipal scale, the experience of wastewater design engineers nationwide, and case-studies of sulfate treatment systems. While the report did not focus on industrial treatment, the conclusions of the report directly inform industrial sulfate treatment costs and implementation concerns, given that foundational engineering theory applies to both municipal and industrial contexts.

Task Force Process

Task Force members heard a panel discussion that included the following presenters:

- Scott Kyser, Wastewater Engineer, Minnesota Pollution Control Agency
- Adrian T. Hanson, Professor Environmental Engineering, University of Minnesota Duluth
- Katie Wolohan, Environmental Engineer, Barr Engineering
- Al Parrella, Head Wastewater Operator, Western Lake Superior Sanitary District
- Dan Jones, MnDRIVE Environment Program Coordinator, BioTechnology Institute & Department of Earth Sciences, University of Minnesota

Information Presented

Every wastewater discharger to a surface water must have a NPDES permit and comply with effluent limits. Effluent limits are calculated to comply with water quality standards. Engineers draw on biology, chemistry, and physics to design treatment systems. Sulfate is a unique chemical to treat because it is highly soluble and chemically unreactive under normal conditions. The 2018 MPCA report *Analyzing Alternatives for Sulfate Treatment in Municipal Wastewater* evaluated 31 technologies for sulfate treatment and scored them relative to screening criteria including effectiveness, operability/maintainability, relative cost, degree and complexity of pre- and post-treatment requirements, and residuals management.⁹³ Reverse osmosis membrane treatment scored the highest in this assessment.⁹⁴ Other treatments are promising but moving beyond bench scale to full scale implementation would require significant investment in research.

Minimization plans are an effective tool permittees can use to develop and implement ways to reduce pollutants at their source rather than installing full-scale treatment processes to treat the entire wastewater flow. MPCA typically requests that permittees complete a minimization plan after a permittee receives a

⁹² "Analyzing Alternatives for Sulfate Treatment in Municipal Wastewater," Bolton & Menk, Inc. and Barr Engineering Company (requested by Minnesota Pollution Control Agency), 84 pp. 2018, <https://www.pca.state.mn.us/sites/default/files/wq-rule4-15pp.pdf>.

⁹³ Analyzing Alternatives for Sulfate Treatment," Bolton & Menk, Inc. and Barr Engineering Company, 2018.

⁹⁴ Analyzing Alternatives for Sulfate Treatment," Bolton & Menk, Inc. and Barr Engineering Company, 2018.

variance or a new permit limit that can't be met with currently installed treatment systems. Minimization plans require permittees to investigate pollutant sources and implement pollutant reduction strategies. Currently, MPCA does not require minimization plans for sulfate, thus no NPDES discharger has one. In addition, MPCA has not developed Sulfate Minimization Plan guidance documents as it has for other required pollutants.

For NPDES dischargers, both municipal and industrial, minimization plans likely hold limited potential. For municipal wastewater treatment, minimization plans hold limited potential because the main source of sulfate being discharged from municipal facilities is from the groundwater supply. Additions of sulfate to residential wastewater are generally less than 50 mg/L, coming from soaps and detergents and human waste. A sulfate minimization program could identify a high sulfate significant industrial user or commercial discharger connected to the municipal wastewater facility, and be a useful tool in this case.

At commercial/industrial discharges, sulfate minimization plans are more likely to be a helpful tool for reducing sulfate loading. No Minnesota taconite mine has formally completed a sulfate minimization plan but all taconite mines have completed equivalent work evaluating ways to minimize sulfate. Work completed includes sulfate minimization strategies such as sulfate source reduction, wetland treatment, and limiting water infiltration, among other strategies. For example, the Dunka Mine has been extensively studied, with sulfate source reductions studies going back to 1986.⁹⁵ A general conclusion from the sulfate minimization work completed at taconite mines thus far is that the “low hanging fruit has already been picked” with regards to sulfate minimization. This means that any further sulfate minimization at Minnesota taconite mines would likely require active sulfate treatment—such as using membrane based treatment technologies.

Not all permitted facilities would experience sulfate treatment costs. Costs would depend on whether an effluent limit would be needed. The effluent limit calculation process requires data inputs such as sulfate monitoring data and a defined protective waterbody sulfate standard. The need for an effluent limit cannot currently be calculated because MPCA lacks monitoring data (surface water sulfate concentrations and wastewater effluent sulfate concentrations) and lacks the protective sulfate water quality standard for every waterbody. The process for collecting this data would be labor intensive and span multiple years.

Only facilities upstream of designated wild rice waters would be reviewed for the potential need for a sulfate effluent limit to meet any wild rice sulfate water quality standard. Of those facilities, not all would require a limit: the need for a limit depends on the concentration of sulfate in their discharge, the level of sulfate in the receiving water, the characteristics of the receiving water, and the protective water quality standard for the downstream waterbody.

Further Reading

- “Sulfate and Municipal Wastewater: Study Confirms Lack of Affordable Technology.” Minnesota Pollution Control Agency. July 2018.

⁹⁵ “Dunka Mine Minnesota Case Study,” Interstate Technology Regulatory Council, August 2010, https://www.itrcweb.org/miningwaste-guidance/cs_dunka_mine.htm.

<https://www.egb.state.mn.us/sites/default/files/documents/SulfateTreatment%20Leg%20Fact%20Sheet%207%2030%2018%20FINAL.pdf>.

- “Analyzing Alternatives for Sulfate Treatment in Municipal Wastewater.” Bolton & Menk, Inc. and Barr Engineering Company (requested by Minnesota Pollution Control Agency). 84 pp. 2018.
<https://www.pca.state.mn.us/sites/default/files/wq-rule4-15pp.pdf>.

Water Quality Standard Variances

Understanding the Issue

A variance is a CWA standard and permitting tool that allows MPCA to address situations where meeting a water quality-based effluent limit is not affordable and/or technologically feasible. While a variance does not assume that the effluent limit will be met, it is designed to allow NPDES dischargers time to investigate pollutant reductions and potential compliance solutions.⁹⁶ Variances could be helpful in Minnesota for addressing costs associated with sulfate treatment and compliance with a sulfate water quality standard. Variances have been used effectively in other states to help the permitted community reduce pollutants and make progress toward compliance goals. The MPCA is actively working on improvements to the Minnesota variance process.

Prior/Current Work

Minnesota has had variances as part of the water quality standard rules since 1964. However, the language did not align with the CWA. Because EPA is the final authority on variance approval, this made the variance process arduous for permittees and the state, and in recent years few variances have been issued. MPCA began a project in 2012 to look into the variance process, which led to a closer look at rule language. EPA updated federal variance rules in August 2015 to add clarity to the federal process and requirements. MPCA updated state rules in 2016, and these were approved by EPA in March 2017. Since then, MPCA has been looking at additional ways to streamline and improve the variance process.

Task Force Process

Task Force members heard a presentation from Elise Doucette, Policy Specialist, with the MPCA on Minnesota’s variance process and MPCA’s recent efforts to streamline the process for permittees. Task Force members also heard from Joe Mayasich, Director of Environmental Services at Western Lake Superior Sanitary District (WLSSD)

⁹⁶ Options to investigate pollutant reductions and compliance solutions include both variances and schedules of compliance, which have a specified date when the limit can be met. In the Great Lakes region, compliance schedules are limited to one permit cycle of five years. This may not provide adequate time for the discharger to do pilot testing, facility planning, preliminary and final design, complete applications and receive funding approval within the funding cycle, complete construction and facility commissioning. Variances are also limited to five years in this region, but can be renewed, and so the two tools may work together in that region.

on his experience applying for a variance from the mercury effluent limit based on the mercury water quality standard.

Information Presented

Under the CWA, water quality standards are set based on what is needed to keep the water clean (protect the beneficial use) and not on whether it is affordable to comply with a standard. However, social and economic impact is considered in the wastewater permitting process laid out in federal and state rule. A variance is a CWA tool that provides for the consideration of social and economic impact of requiring a facility to meet an effluent limit based on water quality standard.⁹⁷ A variance is a time limited change to the underlying standard that results in a less stringent interim limit, allowing NPDES dischargers time to investigate solutions and methods to reduce the pollutant at issue. The most common variances are those that apply to a single discharger, though they can also apply to multiple dischargers or on a waterbody basis.

Variances are not a “free pass” to pollute. They require a determination of eligibility and justification to receive, are temporary, and require a public review process. Finally, the discharger is expected to make progress towards their final limit and compliance with the underlying water quality standard remains the ultimate goal (though variances are used when it is not known if compliance can be achieved through existing technology).

The first step is determining if a facility is eligible for a variance – this is most commonly done through a demonstration that the necessary pollutant controls will cause substantial and widespread economic and social impact. For municipal dischargers, the affordability of compliance with a water quality standard is measured using an EPA formula that takes into account wastewater costs per household and median household income in the area of the discharger.⁹⁸ For the current sulfate standard of 10 mg/L, sulfate treatment costs are

⁹⁷ Variance Eligibility Criteria in 40 CFR 131.10(g):

1. Naturally occurring pollutant concentrations prevent the attainment of the use; or
2. Natural, ephemeral, intermittent or low flow conditions or water levels prevent the attainment of the use, unless these conditions may be compensated for by the discharge of sufficient volume of effluent discharges without violating State water conservation requirements to enable uses to be met; or
3. Human caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied or would cause more environmental damage to correct than to leave in place; or
4. Dams, diversions or other types of hydrologic modifications preclude the attainment of the use, and it is not feasible to restore the water body to its original condition or to operate such modification in a way that would result in the attainment of the use; or
5. Physical conditions related to the natural features of the water body, such as the lack of a proper substrate, cover, flow, depth, pools, riffles, and the like, unrelated to water quality, preclude attainment of aquatic life protection uses; or
6. Controls more stringent than those required by sections 301(b) and 306 of the Act would result in substantial and widespread economic and social impact.

⁹⁸ The Primary Affordability Measures is $Annual\ Wastewater\ Cost\ per\ Household \div Median\ Annual\ Household\ Income \leq 2\%$.

unaffordable for all municipal wastewater treatment plants according to this formula. For industrial dischargers, affordability is based on profitability with pollution control as compared to without pollution control. The EPA does not give a specific formula for determining variance eligibility for industrial dischargers, and this work must be done on a case-by-case basis.

In a variance process, the permittee requests a variance and provides economic information and documentation to support their request. MPCA verifies the economics and eligibility. The next step is to determine the highest attainable condition, or the best water quality that can be achieved. The highest attainable condition could be an interim effluent limit that represents installation of the greatest feasible control or, more likely, an effluent limit based on the current pollution control and a set of requirements to investigate and minimize the pollutant. The term of the variance is the length of time it takes to reach the highest attainable condition, such as by completing all the activities in the pollutant minimization plan.

During the process, MPCA will develop an alternative limit as part of the highest attainable condition, sets the term of the variance, drafts a permit, gives public notice of the permit and variance, and holds meetings. The EPA scrutinizes the economic justification and reviews all parts of the variance request in detail for consistency with federal regulations. Once a variance is approved by EPA, it must be reviewed every five years, even if the term of the variance is longer than five years. This ensures that the variance is still appropriate.

Historically, there have been relatively few variances requested and granted in Minnesota as compared to other states. Some permittees in Minnesota perceive the variance process to be difficult and costly, and indeed, there are cases where the process has been considerably more challenging than expected by either the permittee or by the MPCA. The primary areas of frustration from permittees are that the variance process is arduous from a scientific, financial, and administrative perspective. Permittees find the process expensive (including the cost to apply for a variance, consulting fees, and staff time), that it takes too long to go through the process and receive the variance, and that once granted it is burdensome to implement the requirements of the variance.

MPCA addressed these challenges by updating state rules to have one process that collected information for, and satisfied both, state and federal regulations. MPCA has also begun conducting the analysis of treatment options that is required as part of the variance request. In the past, municipalities were responsible for conducting this analysis. This change saves municipalities time and money and ensures the analysis meets MPCA expectations. Going forward, MPCA also plans to develop a variance eligibility tool for sulfate using public data to determine if sulfate treatment (annualized capital and operations and maintenance) would result in more than 2 percent of median household income. This would provide municipalities greater certainty about their eligibility for a variances. MPCA currently uses a similar eligibility tool for chloride.

Further reading

- Doucette, Elise et al. "Guidance for Water Quality Standards Variances." Minnesota Pollution Control Agency. January 2013. <https://www.pca.state.mn.us/sites/default/files/wq-wwprm2-10a.pdf>.
- "Economic Guidance for Water Quality Standards." United States Environmental Protection Agency. <https://www.epa.gov/wqs-tech/economic-guidance-water-quality-standards>.

- “Water Quality Standards Variance Building Tool.” United States Environmental Protection Agency. August 2017. <https://www.epa.gov/wqs-tech/water-quality-standards-variance-building-tool>.
- “Discharger-specific Variances on a Broader Scale: Developing Credible Rationales for Variances that Apply to Multiple Dischargers.” United States Environmental Protection Agency. Frequently Asked Questions Section. March 2013. <https://www.epa.gov/sites/production/files/2018-10/documents/discharger-specific-variances-faqs.pdf>.

Public comment

Members of the public were provided with multiple formats to submit comments, including:

- speaking during the public comment period at Task Force meetings,
- submitting handwritten comments using the public comment form, and
- submitting written comments online via the Environmental Quality Board website.

Additionally, EQB staff and consultants provided contact information for people who preferred to share their comment via phone conversation or e-mail.

In all, 13 people provided 16 comments. Those who provided comments included concerned citizens, representatives of environmental organizations, Tribal members, representatives of wastewater treatment plants, and representatives of businesses proposing sulfate treatment solutions. They provided input on the significance of wild rice, the current sulfate standard, sulfate sources, sulfate discharge into waters, scientific evidence, the identification of wild rice waters, sulfate treatment, and variances.

Significance

Several commenters spoke about the deep cultural and ecological significance of wild rice. Comments included the importance of wild rice for cultural survival and Tribal sovereignty and as an important food source. One commenter mentioned that all Minnesotans benefit from the ecological value of wild rice. Another mentioned the use of wild rice in their culture and ceremonies and that it is part of who they are.

Current standard

Three comments mentioned the current numeric sulfate standard. One person referred to the current standard as “not technologically or economically feasible” and said that he does not believe that there is sufficient evidence that the current standard would protect wild rice. Another person said that strict conformity with the existing sulfate standard is required for new dischargers. A third person called the standard “fine up to a point” but noted that Minnesota has never enforced the standard and alluded to potential legal difficulties MPCA may have experienced had the proposed rule been approved.

Sulfate sources

Two people mentioned the sources and dischargers of sulfate. The first said high levels of sulfate in municipal sewage and wastewater treatment plant effluent likely have high levels of sulfate in their tap water. They stated that prevention of sulfate impacts will need to begin with the identification of the sources of high sulfate inputs. Another comment focused on taconite mining as a source of sulfates.

Sulfate discharge into waters

Four people provided comments calling for the state to effectively regulate or end sulfate pollution. One person said that the effects of high sulfate levels are already observable and that high sulfate levels can have a laxative effect on humans and animals and also contributes to the methylation of mercury. Another comment echoed the concern about the impacts of sulfate on mercury. A third commenter asked the Task Force to focus more on how to manage existing natural resources, rather than focusing on how much pollution the environment can tolerate from one-time extractions. The last comment called for an end to sulfate pollution to protect wild rice and honor the 1854 Treaty.

Scientific evidence

Nearly half of commenters referred to scientific findings. Of those, four comments focused on the contributions Tribal science has made to understanding wild rice and the effect of sulfate on the plant and the value of Tribal lived knowledge and traditional ecological knowledge.

One commenter expressed concerns that there is not enough scientific evidence that the current standard would protect wild rice. Another said that black roots are not unusual and should not be interpreted as dangerous to plants.

One comment said scientific studies have proven significant concentrations of sulfate hinder wild rice growth.

Sulfate treatment

Six people provided seven comments on sulfate treatment. Four comments described biological sulfate treatment solutions. They said the logical approach is to remove large concentrations of sulfate upstream of municipal wastewater treatment plants. They also described their sulfate treatment technology and its effectiveness and concluded that biological sulfate removal is the logical approach when compared and contrasted to reverse osmosis.

One person provided two comments. The first comment said that the technology to treat wastewater from industrial dischargers in order to comply with the sulfate standard is feasible, but Minnesota needs to make it feasible for a discharger to pilot such treatment. The second comment recommended that current and future applications for wastewater permits for copper-nickel mines be required to treat sulfate pollution with reverse

osmosis. The commenter also mentioned that under the CWA, businesses are not required to demonstrate how implementation of a reverse osmosis system would affect their revenues.

One commenter said that requiring municipal wastewater treatment plants to implement reverse osmosis would cost tens or hundreds of millions of dollars and may not be protective of wild rice. The comment also mentioned that the sludge produced by reverse osmosis would have negative environmental impacts.

Variations

Two people provided comments regarding variations. One person said that the resources needed to obtain a variance are often disregarded. The other person commented that a water quality standard that relies heavily on variations will not be protective of wild rice.

Appendix

Appendix A: Members of the Governor's Task Force on Wild Rice

Kurt Anderson

Electric Utility Representative

Paul Austin

Environmental Nongovernmental Organization Representative

Chrissy Bartovich

Ferrous Mining Industry Representative

Leya Charles

Minnesota Dakota Tribal Representative

Gary Drotts

Non-Native Wild Rice Harvester

Kathryn Hoffman

Environmental Nongovernmental Organization Representative

Emi Ito

Independent Scientist with Expertise in Wild Rice Research, Plant-Based Aquatic Toxicity

Norman Miranda

Municipal Wastewater Discharger Representative

Brad Moore

Non-Ferrous Mining Industry Representative

Catherine Neuschler

Ex-Officio Representative of the Minnesota Pollution Control Agency

Ann Pierce

Ex-Officio Representative of the Department of Natural Resources

Al Pemberton

Red Lake Nation Representative

John Rebrovich

Statewide Labor Organization Representative

Carol Reschke

Independent Scientist with Expertise in Wild Rice Research, Plant Community Ecology

Appendix B: Timeline of major events

The purpose of this timeline (Table 1) is to highlight key events that are pertinent to Task Force discussions. This is not a complete representation of all events related to wild rice, the sulfate standard, government, Tribal or stakeholder actions, or cultural history.

Table 1: Timeline

| Time Period | Event |
|----------------------|---|
| Over 2,000 years ago | <ul style="list-style-type: none"> Indigenous peoples including ancestors of Dakota and Lakota harvest and cook wild rice, based on archaeological evidence gleaned from pottery used for cooking. |
| Over 600 years ago | <ul style="list-style-type: none"> Ancestral Ojibwe prophecy leads people from the Atlantic coast to Minnesota and Wisconsin, where they find “food that grows on water.” American Indians managed the wild rice to ensure there was enough to sustain their needs, the needs of wildlife, and reseed for future years—management activities continue to the present day. |
| 1930s-1960s | <ul style="list-style-type: none"> Beginning in the 1930’s Dr. John Moyle began to document his observations about wild rice and sulfate levels. Cultivated wild rice industry begins in Minnesota and produces an estimated 10 million pounds per year at its peak in the 1980s. University of Minnesota carries out legislatively funded research supporting the cultivated wild rice industry with an extension laboratory located in Grand Rapids, MN. State wild rice harvest license sales peak in 1960’s. |
| 1970s | <ul style="list-style-type: none"> United States Clean Water Act is restructured. Minnesota adopted the current wild rice sulfate standard (1973). Minnesota Legislature makes wild rice the official state grain (1977). |
| Late 1990s | <ul style="list-style-type: none"> The wild rice sulfate standard was first revisited; narrative standard is added for the 24 designated water bodies, as is beneficial use language: “harvest and use of grains from this plant as a food source for wildlife and humans.” |
| 2007 | <ul style="list-style-type: none"> The Minnesota Legislature passed a law requiring the preparation of an Environmental Impact Statement in the event of an application to genetically engineer wild rice. (MN Rules Ch. 116C.94 Subd. 1). The Minnesota Legislature passed a law requiring the Commissioner of Natural Resources to prepare a study for natural wild rice that includes location of natural stands, potential threats to natural stands, and recommendation on protecting wild rice: |
| 2008 | <ul style="list-style-type: none"> Minnesota Department of Natural Resources (MNDNR) completes Natural Wild Rice in Minnesota report, which includes a list of wild rice waters in Appendix B of that report. |

| Time Period | Event |
|-------------|---|
| 2010 | <ul style="list-style-type: none"> • MNDNR’s interagency Wild Rice Management Workgroup creates a list of the 350 most important wild rice waters. • As part of its triennial review, MPCA recognized the need to further understand and clarify the sulfate standard. |
| 2011 | <ul style="list-style-type: none"> • The Minnesota Legislature provides funding to the MPCA to research the effects of sulfate and other substances on wild rice. • Wild Rice Advisory Committee begins to advise MPCA on research and rulemaking. |
| 2012 | <ul style="list-style-type: none"> • MPCA begins research on the impacts of sulfate on wild rice. |
| 2014 | <ul style="list-style-type: none"> • MPCA releases Wild Rice Sulfate Standard Preliminary Analysis (March) • MPCA drafts Analysis of the Wild Rice Sulfate Standard Study for scientific peer review (June) • MPCA receives peer review feedback (September). • Fort et al. publish findings. |
| 2016-2017 | <ul style="list-style-type: none"> • MPCA works on the development of rule revisions for the sulfate water quality standard. • The requirement for Tribal members to have a state license to harvest rice on state waters outside of Tribal reservations and ceded territories is dropped. (2016). |
| 2017-2018 | <ul style="list-style-type: none"> • MPCA undergoes rulemaking process, proposing an equation-based standard and initial list of approximately 1300 waters to be designated as wild rice waters. • Administrative Law Judge reviews and disapproves of the MPCA’s proposed rule in early 2018. • MPCA withdraws rule in 2018. • Governor Dayton issues Executive Order 18-08 establishing the Governor’s Task Force on Wild Rice • Fond du Lac published notice of their revised water quality standards for public comment under their federal Clean Water Act authority. The Band is proposing to maintain their 10mg/L sulfate standard, and are adding protective narrative standards for wild rice waters (2018). |

Appendix C: Definitions

The following terms are commonly used in the scientific community to explain how pollution from sulfates affects wild rice.

Correlation

Scientists use the word “correlation” to describe a distinct relationship between two or more factors. Correlations can be positive (both increase or decrease at the same time) or negative (as one increases, the other decreases). An important aspect of correlation is that correlation does not necessarily mean that one factor *causes* the other to happen. It could be that both factors are correlated and caused by a third factor.

Effluent

An outflowing of water or gas to a natural body of water, from a structure such as a wastewater treatment plant, sewer pipe, or industrial outfall.

Field surveys

In field surveys, scientists observe wild rice in its natural state by measuring various factors, such as water levels, water clarity, and level of chemicals (sulfate, sulfide, iron, etc.) and observing patterns in the environment. This method helps scientists understand what controls the occurrence and density of wild rice in its natural habitat. However, it does not allow scientists to experiment by controlling the environmental factors, and circumstances can vary widely among the different bodies of water.

Hydroponic

This is a type of scientific experiment where plants are grown in a laboratory environment without soil. Instead, the plants grow in water with added minerals and nutrients. This type of experiment helps scientists understand how a plant responds to a specific chemical (in this case varying levels sulfate and sulfide) when all other factors are the same. Critics of this method say it does little to inform what happens in a natural environment.

Mesocosm experiment

This type of scientific experiment attempts to simulate a more natural environment by growing plants in a container (with soil) that is kept outdoors. Using this method, scientists can control for many factors, such as water and soil chemistry, while still exposing the plant to similar outdoor conditions as it would experience in nature. It is difficult to make conclusions based on mesocosms alone because the plant is not completely in its natural environment (like in field surveys) and because scientists cannot control for everything that happens to the plant (like in hydroponics). In addition, conducting an experiment in a container cannot accurately simulate changes in the water, porewater, and sediment that may occur in nature, such as increases iron.

Porewater

Porewater is the water present in the top layers of sediment, between the solid particles of mineral and organic matter (such as decaying plants).

Sulfate and sulfide

In plain language and for the purposes of this narrative, sulfate is a molecule composed of sulfur and oxygen. Sulfate has multiple oxygen atoms, which make the molecule stable, where oxygen is present, and less apt to bond or react with other chemicals. Sulfate occurs naturally and is also concentrated in wastewater and water draining from rock piles and tailings created by taconite mines.

Bacteria that live at the bottom of lakes and streams (like the bacteria that feed on decaying plants) initially respire (or “breathe”) oxygen until there is no oxygen remaining (“anoxic”). Under the resulting anoxic conditions, bacteria need to use other chemicals. If sulfate is available, the bacteria can take oxygen from the sulfate, which converts the sulfate into a sulfide. Sulfide has a strong tendency to bond with any available metals such as iron, which detoxifies the sulfide.

Units of measure

Milligrams per liter (mg/L): A milligram is one-thousandth of a gram

Parts per million (ppm): equal to one milligram per liter

Micrograms per liter ($\mu\text{g/L}$): A microgram is one-thousandth of a milligram, or one-millionth of a gram

Appendix D: Executive Orders

STATE OF MINNESOTA

EXECUTIVE DEPARTMENT



MARK DAYTON
GOVERNOR

Executive Order 18-08

Establishing the Governor's Task Force on Wild Rice

I, Mark Dayton, Governor of the State of Minnesota, by virtue of the authority vested in me by the Constitution and applicable statutes, do hereby issue this Executive Order:

Whereas, wild rice is the Official State Grain of Minnesota;

Whereas, wild rice is culturally important and spiritually sacred to Minnesota's Tribal Nations;

Whereas, the harvest and cultivation of wild rice is economically important to the State of Minnesota;

Whereas, the availability of wild rice is important to sustaining waterfowl and wildlife;

Whereas, the health of wild rice is dependent on water quality and other habitat conditions;

Whereas, the scientific understanding of the water quality and habitat conditions necessary for restoration and protection of naturally occurring wild rice has advanced through legislatively-funded research;

Whereas, the State of Minnesota has goals to restore degraded wild rice habitat and to protect naturally occurring wild rice stands; and

Whereas, the restoration and protection of wild rice habitat requires collaboration among state agencies, Tribal Nations, wild rice harvesters, industry, conservation advocacy groups, and scientists.

Now, Therefore, I hereby order that:

1. The Governor's Task Force on Wild Rice ("Wild Rice Task Force") is established with the following members to be appointed by the Governor:
 - a. one representative nominated by the Minnesota Indian Affairs Council;
 - b. one representative nominated by the Minnesota Chippewa Tribe;

- c. two independent scientists with expertise in wild rice research and plant-based aquatic toxicity;
 - d. one non-native wild rice harvester;
 - e. one representative from the ferrous mining industry;
 - f. one representative from the non-ferrous mining industry;
 - g. one representative from a municipal wastewater discharger;
 - h. one representative of an electric utility;
 - i. one representative of a statewide labor organization;
 - j. two representatives from environmental nongovernmental organization; and
 - k. one representative each from the Department of Natural Resources and the Minnesota Pollution Control Agency appointed by the commissioner of each entity to serve as an ex officio member.
2. The Wild Rice Task Force must review existing peer-reviewed scientific literature, both state-sponsored and otherwise, to identify information that is available to inform understanding of the impacts of sulfate or other sulfur compounds or habitat conditions on wild rice. The Wild Rice Task Force shall also identify information gaps in the scientific literature and make recommendations on priorities for wild rice research.
 3. The Wild Rice Task Force will prepare a report addressing the following questions:
 - a. Which water bodies used for producing wild rice should be added to or removed from the list of wild rice waters identified in Minn. R. 7050.0470, subpart 1 and part 7050.0471 subparts 3 through 9 in the Revisor's draft of rules proposed by the Minnesota Pollution Control Agency dated March 16, 2018?
 - b. What are the best management practices necessary for restoration and protection of natural wild rice stands?
 - c. What is the condition of wild rice waters downstream of selected permitted wastewater dischargers?
 - d. Are there any potential mitigating factors for wild rice to grow in waters with sulfate concentrations greater than 10 mg/L?
 - e. What is the level of funding needed and sources of potential funding to support: data collection and research; restoration and protection activities; best management practices; sulfate minimization plans; and the development and installation of cost-effective sulfate treatment technologies?
 4. The Wild Rice Task Force will be convened by the Environmental Quality Board which may contract for consulting and facilitation services. The Department of Natural Resources and the Minnesota Pollution Control Agency will provide technical expertise to support the Wild Rice Task Force.
 5. The Wild Rice Task Force shall deliver its completed report to the Governor by December 15, 2018.
 6. After receiving the completed Wild Rice Task Force report the Governor shall transmit the report to the chairs and minority leads of the Minnesota House and Senate environmental policy committees and to the Minnesota Tribal Nations.

7. On behalf of the Governor, the Environmental Quality Board will engage in formal consultation with Minnesota Tribal Nations on the recommendations contained in the Wild Rice Task Force report.

This Executive Order is effective fifteen days after publication in the State Register and filing with the Secretary of State, and shall remain in effect until rescinded by proper authority or until it expires in accordance with Minnesota Statutes, Section 4.035, subdivision 3.

In Testimony Whereof, I have set my hand on this 30th day of May, 2018.



Mark Dayton
Governor

Filed According to Law:



Steve Simon
Secretary of State



STATE OF MINNESOTA

EXECUTIVE DEPARTMENT



MARK DAYTON
GOVERNOR

Executive Order 18-09

Amending Executive Order 18-08: Establishing the Governor's Task Force on Wild Rice

I, Mark Dayton, Governor of the State of Minnesota, by virtue of the authority vested in me by the Constitution and applicable statutes, do hereby issue this Executive Order:

Whereas, Executive Order 18-08 was filed on May 30, 2018, providing for the establishment of the Governor's Task Force on Wild Rice;

Whereas, to amend Executive Order 18-08 subsection 1 located on pages 1 and 2.

Now, Therefore, I hereby order that subsection 1 be amended to read as follows:

1. The Governor's Task Force on Wild Rice ("Wild Rice Task Force") is established with the following members to be appointed by the Governor:
 - a. one representative nominated by the Minnesota Chippewa Tribe;
 - b. one representative nominated by the four Minnesota Dakota Tribes, which include the Shakopee Mdewakanton Sioux Community, Prairie Island Indian Community, Lower Sioux Indian Community, and Upper Sioux Community;
 - c. one representative nominated by Red Lake Nation;
 - d. two independent scientists with expertise in wild rice research and plant-based aquatic toxicity;
 - e. one non-native wild rice harvester;
 - f. one representative from the ferrous mining industry;
 - g. one representative from the non-ferrous mining industry;
 - h. one representative from a municipal wastewater discharger;
 - i. one representative of an electric utility;
 - j. one representative of a statewide labor organization;

- k. two representatives from environmental nongovernmental organization;
and
- l. one representative each from the Department of Natural Resources and the Minnesota Pollution Control Agency appointed by the commissioner of each entity to serve as an ex officio member.

This Executive Order is effective fifteen days after publication in the State Register and filing with the Secretary of State, and shall remain in effect until rescinded by proper authority or until it expires in accordance with Minnesota Statutes, Section 4.035, subdivision 3.

In Testimony Whereof, I have set my hand on this 28th day of June, 2018.



Mark Dayton
Governor

Filed According to Law:



Steve Simon
Secretary of State



Appendix E: Minnesota Chippewa Tribe Resolution

RESOLUTION 107-18

- WHEREAS,** the Minnesota Chippewa Tribe is comprised of six member reservations (Bois Forte, Fond du Lac, Grand Portage, Leech Lake, Mille Lacs, and White Earth); and
- WHEREAS,** the Tribal Executive Committee is the duly elected governing body of the Minnesota Chippewa Tribe and is comprised of the Chairpersons and Secretary/Treasurers from the six bands; and
- WHEREAS,** our people have lived along the lakes, rivers, and streams of northern Minnesota since time immemorial and Mother Earth has blessed our homelands with an abundance of clean water where our sacred manoomin (wild rice) flourishes; and
- WHEREAS,** manoomin is not simply a resource, it played a central role in the migration of Ojibwe and continues to hold a unique and sacred place in the lives and traditions of the Minnesota Chippewa Tribe and our over 41,000 members; and
- WHEREAS,** decreasing water quality and environmental degradation caused by irresponsible development and inadequate enforcement of the Clean Water Act pose an existential threat to our sacred manoomin and in turn our way of life; and
- WHEREAS,** it is critically important to protect clean water and the best way to protect water in today's society is to properly enforce the Clean Water Act; and we ask that the Governor of the State of Minnesota and Minnesota Pollution Control Agency to uphold State Water Quality Standards and the Clean Water Act; and
- WHEREAS,** on May 30, 2018, Governor Mark Dayton filed Executive Order 18-08 which provided for the establishment of the Governor's Task Force on Wild Rice; and
- WHEREAS,** the Governor's Task Force on Wild Rice was charged with reviewing scientific literature to identify information related to the impacts of sulfate or other sulfur compounds or habitat conditions on wild rice and shall prepare comments that address environmental conditions that contribute to wild rice population declines; and
- WHEREAS,** Executive Order 18-08 provided that the Governor's Task Force on Wild Rice would be comprised of: one representative nominated by the Minnesota Indian Affairs Council; one representative nominated by the Minnesota Chippewa Tribe; two independent scientists with expertise in wild rice research and plant-based aquatic toxicity; one non-native wild

rice harvester; one representative from the ferrous mining industry; one representative from the non-ferrous mining industry; one representative from a municipal wastewater discharger; one representative from an electric utility; one representative from a statewide labor organization; two representatives from environmental nongovernmental organizations; and one representative each from the DNR and MPCA to serve as ex officio members; and

WHEREAS, the Minnesota Chippewa Tribe responded to Executive Order 18-08 by passing a resolution and sending a correspondence to Governor Dayton informing him that each Band of the Minnesota Chippewa Tribe would like to have one representative on the Governor's Task Force on Wild Rice; and

WHEREAS, Governor Dayton responded by informing the Minnesota Chippewa Tribe that the composition of the Governor's Task Force on Wild Rice was governed by Minnesota Statutes 15.0593 and only fifteen (15) representatives could be appointed to the task force in question; and

WHEREAS, on June 28, 2018, Governor Mark Dayton filed Executive Order 18-09 which amended Executive Order 18-08 and changed the composition of the task force in the following manner: the representative appointed by the Minnesota Indian Affairs Council was deleted; one representative was to be nominated by the four Minnesota Dakota Tribes; and one representative was to be nominated by the Red Lake Nation; and

WHEREAS, the proposed composition of the Governor's Task Force on Wild Rice does not respect the sovereignty of the eleven federally-recognized Indian Tribes, Bands, and Communities in the State of Minnesota, and our unique status as federally recognized tribes that have guaranteed usufructory rights by Treaties, and

WHEREAS, the proposed Wild Rice Task Force composition does not acknowledge that Indian tribes will be disproportionately affected by the loss of a usufructory property rights directly related to legislation prohibiting enforcement of existing water quality standards and the composition minimizes the technical expertise, knowledge, and interests of Indian tribes; and

WHEREAS, the proposed Wild Rice Task Force composition directly relegates the Tribes to the status of special interest groups and industry rather than honoring Tribal sovereignty; and

WHEREAS, treating Indian tribes like special interest groups is disrespectful and contrary to Executive Order 13-10 which provides that “[a]ll Executive Branch agencies of the State of Minnesota shall recognize the unique legal relationships between the State of Minnesota and the Minnesota Tribal Nations, respect the fundamental principles that establish and maintain this relationship, and accord Tribal Governments the same respect accorded to other governments”; and

WHEREAS, the proposed composition of the Governor’s Task Force on Wild Rice is similar to the MPCA Wild Rice Advisory Board where during the process and through consultation, the comprehensive comments provided on behalf of Indian tribes to the MPCA was disregarded entirely and not incorporated in the proposed wild rice rule; and

WHEREAS, the Tribal Executive Committee of the Minnesota Chippewa Tribe finds that it is in the Tribe’s best interest to decline/reject the Governor’s offer to participate in the Governor’s Task Force on Wild Rice and instead will form a task force of its own expertise by inviting the other federally recognized Indian tribes in Minnesota to participate in gathering and reviewing information, preparing comments, and recommendations; and

BE IT RESOLVED, that the Minnesota Chippewa Tribe declines the Governor’s offer to participate in the Governor’s Task Force on Wild Rice; and

BE IT FURTHER RESOLVED, that the Minnesota Chippewa Tribe hereby establishes the Tribal Wild Rice Task Force which will be comprised, provided that such other federally-recognized tribes in Minnesota choose to participate, of:

- a. two representatives nominated by the Bois Forte Band;
- b. two representatives nominated by the Fond du Lac Band;
- c. two representatives nominated by the Grand Portage Band;
- d. two representatives nominated by the Leech Lake Band;
- e. two representatives nominated by the Mille Lacs Band;
- f. two representatives nominated by the White Earth Band;
- g. two representatives nominated by the Red Lake Nation;

- h. two representatives nominated by the Lower Sioux Indian Community;
- i. two representatives nominated by the Prairie Island Indian Community;
- j. two representatives nominated by the Shakopee Mdewakanton Sioux Community; and
- k. two representatives nominated by the Upper Sioux Community.

BE IT FURTHER RESOLVED, that the Tribal Wild Rice Task Force will review existing literature, including literature and information based on tradition, culture, and science, that is available to inform the understanding of the impacts of sulfate or other sulfur compounds on habitat conditions on wild rice, identify information gaps, make recommendations on priorities for wild rice research and prepare a report with recommendations in a similar fashion to that included in Executive Order 18-08, and provide such report to the Governor by December 15, 2018; and

BE IT FINALLY RESOLVED, that this Resolution shall serve as an official invitation to the other federally-recognized tribes in Minnesota to participate in the Tribal Wild Rice Task Force, shall serve as the official response to Governor Mark Dayton concerning the Governor's Task Force on Wild Rice, and shall serve as notice to the State of Minnesota and its agencies that the Minnesota Chippewa Tribe will only participate in government to government consultation on this issue with the Governor or an appropriately high ranking official.

We do hereby certify that the foregoing Resolution was duly presented and acted upon by a vote of 9 For, 0 Against, 0 Silent, at a Special Meeting of the Minnesota Chippewa Tribal Executive Committee, a quorum present, held on August 21, 2018 in Onamia, Minnesota.



Kevin R. Dupuis, Sr., President
THE MINNESOTA CHIPPEWA TRIBE



Melanie Benjamin, Secretary
THE MINNESOTA CHIPPEWA TRIBE

Appendix F: Minnesota Indian Affairs Council Resolution



RESOLUTION 06142018_02

WHEREAS, the Minnesota Indian Affairs Council Membership consists of representatives of the eleven federally-recognized Indian Tribes located within the State of Minnesota, members of the legislature, commissioners from the state departments, and

WHEREAS, the Minnesota Indian Affairs Council is a liaison between the state and local units of government in the delivery of services to American Indians in the State of Minnesota, and

WHEREAS, our people have lived along the lakes, rivers, and streams of Minnesota since time immemorial and Mother Earth has blessed our homelands with an abundance of clean water where our sacred wild rice flourishes; and

WHEREAS, wild rice holds a unique and sacred place in the lives and traditions of the eleven federally-recognized tribes and their members; and

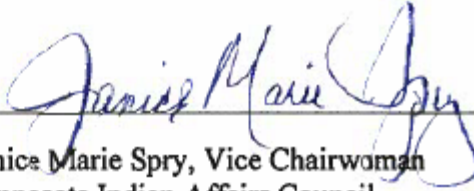
WHEREAS, the Minnesota Indian Affairs Council appreciates Governor Mark Dayton's recent efforts to protect wild rice by ensuring that water quality standards are not undermined, and supports the creation of a wild rice task force provided that each of the Tribal Nations represented by the Minnesota Indian Affairs Council be provided a separate seat on the task force;

THEREFORE BE IT RESOLVED, that the Minnesota Indian Affairs Council does authorize each Tribal Nation represented by the Minnesota Indian Affairs Council to appoint an individual to sit on the wild rice task force recently created by Governor Mark Dayton.

CERTIFICATION: We do hereby certify that the foregoing resolution was duly presented and acted upon by a vote of 8 For, 0 Against, 0 Silent at Regular Meeting of the Minnesota Indian Affairs Council, a quorum present, held on June 14, 2018, at Welch, Minnesota.



Robert L. Larsen, Chairman
Minnesota Indian Affairs Council



Janice Marie Spry, Vice Chairwoman
Minnesota Indian Affairs Council

Appendix G: Letter from Task Force on Wild Rice to MCT

Governor's Task Force on Wild Rice

Date

C/O Minnesota Environmental Quality Board

520 Lafayette Road North

Saint Paul, MN 55155

Dear [name of Tribal Chairperson],

The Governor's Task Force on Wild Rice came together for the first time on Thursday, September 27, 2018. The purpose of the Task Force is to inform a report to Governor Dayton per Executive Order 18-08/18-09 and to build a foundation for addressing the cultural, environmental, and economic interests many Minnesotans have on this complex issue. As Task Force members, we hope to accomplish this purpose by hearing from others, sharing our perspectives, and creating a sustainable wild rice vision for the future.

At the September 27th meeting, we learned that the Minnesota Chippewa Tribe had elected not to appoint a representative to the Governor's Task Force on Wild Rice. Task Force facilitators and Tribal Liaison Ed Fairbanks provided insight on MCT's concerns, and we understand and share many of them. The perspective of MCT and member Bands on the issues before the Task Force is essential given the spiritual and cultural significance of manoomin to the Ojibwe people, your knowledge of wild rice ecology and management, and your sovereign status.

We were encouraged to learn that the Minnesota Chippewa Tribe is convening an All Nations Wild Rice Task Force. We are writing to extend an invitation to explore opportunities for collaboration, communication, and information sharing that meet your needs. We are open to any format that would allow for meaningful dialogue including hearing directly from Tribal leaders about your concerns and views, information sharing between the two task forces, presentations by tribal experts to the Governor's Task Force, or attending each other's meetings.

Please also note that all Task Force meetings are open to the public and Tribal members, staff, and leadership are always welcome to attend. Upcoming meeting dates and locations are listed after the signatures below. There are opportunities for oral and written public comment at the meetings, or anyone can submit comments online at <http://bit.ly/wildricecomment>.

We understand that Minnesota Chippewa Tribe leadership has been engaging in Government-to-Government consultation with Governor Dayton and his Office. We sent the enclosed letter to the Governor to encourage him to continue to engage in that process. At the same time, we remain open and sincerely interested in engaging with you in any way that meets your requirements.

We recognize the long history of fraught relations between the State of Minnesota and Tribal Nations. We would be honored to work with you to develop a way forward that is respectful and demonstrates respect for your sovereignty.

Thank you for your time and consideration.

Sincerely,

Kurt Anderson, Minnesota Power
(Electric Utility Representative)

Paul Austin, Conservation Minnesota
(Environmental NGO)

Chrissy Bartovich, U.S. Steel
(Ferrous Mining Industry Representative)

Gary Drotts, independent
(Non-Native Wild Rice Harvester)

Emi Ito, University of Minnesota
(Independent Scientist)

Brad Moore, PolyMet Mining
(Non-Ferrous Mining Industry Representative)

John Rebrovich, United Steelworkers, District 11
(Statewide Labor Organization Representative)

Catherine Neuschler, Minnesota Pollution Control
Agency
(Ex-Officio)

Leya Charles, Prairie Island Indian Community
(Minnesota Dakota Tribal Representative)

Kathryn Hoffman, Minnesota Center for
Environmental Advocacy
(Environmental NGO)

Norman Miranda, Central Iron Range Sanitary Sewer
District
(Municipal Wastewater Discharger Representative)

Al Pemberton, Red Lake Department of Natural
Resources
(Red Lake Nation Representative)

Ann Pierce, Minnesota Department of Natural
Resources
(Ex-Officio)

cc. Office of Governor Mark Dayton

Governor's Task Force on Wild Rice Meetings, 9:00 a.m. – 4:00 p.m.

- October 25/26, 2018 - North Central Research and Outreach Center - 1861 East US Highway 169, Grand Rapids MN 55744
- November 8, 2018 - MnDOT Arden Hills Training Center - 1900 County Rd I, Shoreview, MN 55126
- November 20, 2018 - Blandin Foundation - Stender Community Room 100 N Pokegama Ave, Grand Rapids
- December 6, 2018 - Twin Cities, TBD
- December 20, 2018 - Veterans Service Building - Fifth Floor Conference Room, W 12th St, St Paul

Please see <https://www.eqb.state.mn.us/content/governors-task-force-wild-rice> for agendas and additional details.

Appendix H: Letter from Task Force on Wild Rice to Governor Dayton

Governor's Task Force on Wild Rice
Date

Recipient Name
Office of the Governor
130 State Capitol
75 Rev Dr. Martin Luther King Jr. Blvd.
St. Paul, MN 55155

Dear Recipient Name:

The Governor's Task Force on Wild Rice met for the first time on Thursday, September 27, 2018. As members of the Governor's Task Force on Wild Rice, we recognized that it is vital to the success of this task force to have the Chippewa Tribes' perspectives represented in the task force process. To that end, we sent the enclosed letter to each of the Minnesota Chippewa Tribes with the intent of exploring with them whether there are ways to collaborate, communicate, and share information. We understand that your office has been engaging in Government to Government consultation with Minnesota Chippewa Tribe leadership regarding the task force and opportunities for collaboration. We respectfully request that your office continue to work with Minnesota Chippewa Tribe leadership to develop a path for collaboration with the Governor's Task Force on Wild Rice.

Sincerely,

Kurt Anderson, Minnesota Power
(Electric Utility Representative)

(Environmental NGO)

Chrissy Bartovich, U.S. Steel
(Ferrous Mining Industry Representative)

Leya Charles, Prairie Island Indian Community
(Minnesota Dakota Tribal Representative)

Gary Drotts, independent
(Non-Native Wild Rice Harvester)

Kathryn Hoffman, Minnesota Center for
Environmental Advocacy
(Environmental NGO)

Emi Ito, University of Minnesota
(Independent Scientist)

Norman Miranda, Central Iron Range Sanitary Sewer
District

Paul Austin, Conservation Minnesota

(Municipal Wastewater Discharger Representative)

(Ex-Officio)

Brad Moore, PolyMet Mining
(Non-Ferrous Mining Industry Representative)

Al Pemberton, Red Lake Department of Natural
Resources
(Red Lake Nation Representative)

John Rebrovich, United Steelworkers, District 11
(Statewide Labor Organization Representative)

Ann Pierce, Minnesota Department of Natural
Resources
(Ex-Officio)

Catherine Neuschler, Minnesota Pollution Control
Agency

Appendix I: Process Agreement



Governor's Task Force on Wild Rice Process Agreement

I. Purpose and Goals

The purpose of the Governor's Task Force on Wild Rice is to identify effective solutions that will protect and restore wild rice and its waters and support the vitality of Minnesota communities, cultures, ecosystems, and economies. Task Force members will accomplish this purpose by hearing others, sharing their perspectives, building a sustainable wild rice vision for the future and developing the relationships necessary for the implementation of those solutions. As outlined in Executive Order 18-08, the Task Force will submit a report to the Governor in December 2018.

II. Members

Kurt Anderson

Electric Utility Representative

Paul Austin

Environmental Nongovernmental Organization Representative

Chrissy Bartovich

Ferrous Mining Industry Representative

Leya Charles

Minnesota Dakota Tribal Representative

Gary Drotts

Non-Native Wild Rice Harvester

Kathryn Hoffman

Environmental Nongovernmental Organization Representative

Emi Ito

Independent Scientist with Expertise in Wild Rice Research, Plant-Based Aquatic Toxicity

Norman Miranda

Municipal Wastewater Discharger Representative

Brad Moore

Non-Ferrous Mining Industry Representative

Catherine Neuschler
Ex-Officio Representative of the Minnesota Pollution Control Agency

Ann Pierce
Ex-Officio Representative of the Department of Natural Resources

Al Pemberton
Red Lake Nation Representative

John Rebrovich
Statewide Labor Organization Representative

Carol Reschke
Independent Scientist with Expertise in Wild Rice Research, Plant Community Ecology

III. Role of members

The task force will operate in a collaborative fashion. Members are expected to fully participate in all meetings and to articulate their views and the views of any constituencies they represent. Additionally, members are expected to strive to bridge gaps in understanding, seek creative resolution of differences which integrate the needs of all stakeholders, and to commit to the purpose enumerated above.

Given the complexity of the issues and the short-time frame, attendance at all meetings will be essential to the task force achieving its purpose. Therefore, the use of alternates is discouraged. However, should a member be unable to attend a meeting, he or she may designate ONE individual to attend in his or her absence. In order to facilitate meaningful contributions by alternates, they are encouraged to observe as many meetings as possible. Task Force members are expected to read meeting summaries and materials of meetings they cannot attend.

IV. Decision Making

The group will operate by consensus, and every effort will be made to develop solutions meet the diverse needs of all impacted Minnesotans.

The group will reach consensus on an issue when it agrees upon a proposal and each member can honestly say:

- I believe that other members understand my point of view.
- I believe I understand other members' points of view.
- Whether or not I prefer this decision, I support it because it was arrived at openly and fairly and it is the best solution for us at this time.

Members should not block or withhold consensus unless they have serious reservations with the approach or solution that is proposed for consensus. If members disagree with the approach or solution selected by the rest of the group, they should make every effort to offer an alternative which integrates the interests articulated by other members. Members should remain at the table during deliberations to hear the full discussions in order to make informed judgments when decision making occurs.

If the process generates consensus recommendations, members agree to support and advocate for the recommendations within their own constituencies, to authorities having jurisdiction and with the public. If consensus is reached, members agree to refrain from commenting negatively on the recommendations. To the extent that the process does not reach a final consensus on some or all issues, members retain the right to comment on those issues.

V. Internal Communication

Participation in meetings will be restricted to members, unless the facilitator sets aside time on the agenda for others to speak. In order to facilitate an open and collaborative discussion, members agree to:

- i. Assume best intent. Give each other the benefit of the doubt
- ii. Speak your own truths—don't generalize
- iii. Respect culturally appropriate ways of participation
- iv. Create space for brainstorming
- v. Seek to understand. Ask clarifying questions.
- vi. Come prepared for the discussion.
- vii. Don't interrupt. Let people finish their thoughts
- viii. Share the air. Be mindful of how long you speak.
- ix. Respectfully disagree when needed. Create a space for and engage with difference.
- x. Listen to learn. Share what's important to you.
- xi. Be mindful—listen, participate, and be present
- xii. Don't squash ideas—be willing to work on the hard stuff
- xiii. Try to see things from a different perspective
- xiv. Share your interests and concerns; don't just restate positions
- xv. Express concerns in an unconditionally constructive manner
- xvi. Suspend certainty

Members are expected to communicate concerns, interests, and ideas openly and to make the reasons for their disagreements clear. Members agree to address their concerns directly to the person(s) with whom they have concerns. This may happen in the context of meetings, through direct communication, or, when requested, with the assistance of the facilitators. The facilitators may serve as a channel of communication for such concerns. Upon request, all information or views shared during conversations with the facilitators will be kept confidential.

VI. External Communication

a. Media

Members agree not to reach out to the media until the process is concluded. If the media contacts a member regarding the process or a topic being addressed by the process, the member agrees to direct the media to EQB which will make a neutral statement about the group's work.

b. Social Media

For the duration of the task force, members agree to refrain from making negative comments on social media about the process or participants.

c. Open Meeting Law

The task force is subject to Minnesota Open Meetings Law chapter 13D. This means that the public and media may attend meetings of the task force, notice of task force meetings must be provided to the public, and documents used at meetings must be available to the public. EQB will provide notice of meetings and post materials to its website. Meeting summaries will be posted to the website, but will not include statements made by individual members.

VII. Public Engagement

The public will be given the option of submitting comment in paper form at Task Force meetings or online via web link: <http://bit.ly/wildricecomment>. The deadline for submitting a comment is November 30, 2018.

Public comment will be taken at all Task Force meetings beginning October 11, 2018. At certain points, the public may be given the option to participate in some activities alongside the Task Force. In such cases, that input will be included in the synthesis of public input.

Materials submitted as public input will be shared with Management Analysis and Development (MAD). MAD will compile comments to the Task Force to review and deliberate. When necessary, MAD will summarize comments received for the Task Force. Public input will also be compiled, synthesized, and summarized in the final report.

VIII. Role of Facilitators

Facilitation will be provided by the Minnesota Office for Collaboration and Dispute Resolution and the Management and Analysis Division. Facilitator duties include but are not limited to:

- i. Facilitate Task Force meetings
- ii. Develop Task Force meeting agendas
- iii. Identify and synthesize points of agreement and disagreement and communicate these in the form of written meeting summaries
- iv. Assist in building consensus among members
- v. Monitor process agreement compliance
- vi. Advocate for a fair, effective, and credible process, but remain neutral with respect to the outcome of the deliberations
- vii. Engage in continuous design of a complex process which may include group meetings, sub-group meetings, mediations, one-on-one consultations, training or other services

IX. Timeline

Meeting 1: September 27, 2018

Meeting 2: October 11, 2018

Meetings 3 and 4 (retreat): October 25-26, 2018

Meeting 5: November 8, 2018

Meeting 6: November 21, 2018

Meeting 7: December 6, 2018

Meeting 8: December 20, 2019

We the undersigned agree to abide by this process agreement.

Phin 10-11-18
Name Date

Jah Rehnit 10-11-18
Name Date

Art Neuschler 11-Oct 2018
Name Date

Leja Moss 10-11-18
Name Date

Kathy Hoffman 10/11/18
Name Date

Bob Vane 10/11/18
Name Date

[Signature] 10/11/2018
Name Date

Ann Price 10/17/18
Name Date

Emi St 11 Oct 2018
Name Date

[Signature] 10/24/18
Name Date

Cory Brantford 10-11-18
Name Date

Carol Kuchler 8 Nov 2018
Name Date

[Signature] 10-11-18
Name Date

Name Date

[Signature] 10/11/18
Name Date

Name Date

Appendix J: Guiding Principles for Identifying and Selecting Task Force Recommendations

The Task Force used the following guiding principles:

- ❖ Awareness of uncertainty and risk
- ❖ Balancing clarity/certainty and flexibility
- ❖ Consider and work to address complex and changing global dynamics
- ❖ Don't create new problems, i.e., environmental, legal, etc.
- ❖ Elevate societal value in solving problems
- ❖ Identify opportunities for piloting
- ❖ Integrative and innovative solutions
- ❖ Mindful of implementation issues: feasible, realistic, timeliness, high confidence of success
- ❖ Prioritize most impactful and meaningful factors
- ❖ Prioritize recommendations
- ❖ Protect viability of all communities, including economic and environmental sustainability
- ❖ Protection and management of wild rice
- ❖ Roadmap approach: including identification of unknowns and next steps and a workable path for sulfate standard
- ❖ Share the costs, burdens and benefits of solutions
- ❖ Solutions account for cultural significance of wild rice
- ❖ Solutions are broad and multifaceted
- ❖ Solutions respect tribal sovereignty

Appendix I: References

- “350 Important Wild Rice Waters in Minnesota.” Minnesota Department of Natural Resources. 2010.
- “Analysis of the Wild Rice Sulfate Standard Study: Draft for Scientific Peer Review.” Minnesota Pollution Control Agency. June 9, 2014. <https://www.pca.state.mn.us/sites/default/files/wq-s6-42z.pdf>.
- “Analyzing Alternatives for Sulfate Treatment in Municipal Wastewater.” Bolton & Menk, Inc. and Barr Engineering Company (requested by Minnesota Pollution Control Agency). 84 pp. 2018. <https://www.pca.state.mn.us/sites/default/files/wq-rule4-15pp.pdf>.
- Benton-Banai, Edward. The Mishomis Book. Hayward, Wisconsin: Indian Country Communications, Inc. 1988.
- “Chloride reports and guidance documents.” Minnesota Pollution Control Agency. Last revised November 27, 2017. <https://www.pca.state.mn.us/water/chloride-reports-and-guidance-documents>.
- “Draft sulfate standard equation: Options and basis for improvements.” Ramboll Environ (requested by Minnesota Pollution Control Agency). May 16, 2017, updated May 30 2017. 51 pp.
- Crow, Garrett E. and C. Barre Hellquist. Aquatic and wetland plants of northeastern North America. Volume Two, Angiosperms: Monocotyledons. Madison, Wisconsin: The University of Wisconsin Press. 2000.
- “Discharger-specific Variances on a Broader Scale: Developing Credible Rationales for Variances that Apply to Multiple Dischargers.” United States Environmental Protection Agency. Frequently Asked Questions Section. March 2013. <https://www.epa.gov/sites/production/files/2018-10/documents/discharger-specific-variances-faqs.pdf>.
- Doucette, Elise, Nicole Blasing, Brian Fitzpatrice, Nancy Drach, Jaramie Logelin, Corey Mathison, Charly Wojtysiak, Brandon Smith, Stephanie Handeland, David Bael, Bill Cole, carol Sinden, Bruce Henningsgaard, Aida Mendez, Katie Koelfgen, Deb Linlief, Aaron Luckstein, Jeff Udd, Katrina Kessler, Wendy Turri, Shannon, Lotthammer. “Guidance for Water Quality Standards Variances.” Minnesota Pollution Control Agency. January 2013. <https://www.pca.state.mn.us/sites/default/files/wq-wwprm2-10a.pdf>.
- “Draft proposal to protect wild rice from excess sulfate.” Minnesota Pollution Control Agency. March 2015.
- Drewes, Annette. “Sustaining a Ricing Culture: Harvest, distribution, and management of wild rice across the Upper Great Lakes.” Doctoral Dissertation. 2008.
- “Dunka Mine Minnesota Case Study,” Interstate Technology Regulatory Council, August 2010, https://www.itrcweb.org/miningwaste-guidance/cs_dunka_mine.htm.
- “Economic Guidance for Water Quality Standards.” United States Environmental Protection Agency. <https://www.epa.gov/wqs-tech/economic-guidance-water-quality-standards>.

"Final Technical Support Document: Refinements to Minnesota's Sulfate Water Quality Standard to Protect Wild Rice." Minnesota Pollution Control Agency. August 11, 2018.

<https://www.pca.state.mn.us/sites/default/files/wq-rule4-15n.pdf>.

Fletcher, Angela, Olivia Dooley, Johnny Mojica, and Jessie Martin. "The Food That Grows Out of the Water, The Economic Benefits of Wild Rice in Minnesota." Earth Economics (requested by Fond du Lac Band of Lake Superior Chippewa). Tacoma, WA. 2018. <http://www.eartheconomics.org/all-publications/manoomin>.

Fort, Douglas J., Michael B. Mathis, Rachel Walker, Lindsey K. Tuominen, Mike Hansel, Scott Hall, Robin Richards, S. R. Grattan, and Kurt Anderson. "Toxicity of sulfate and chloride to early life stages of wild rice (*Zizania palustris*)." *Environmental toxicology and chemistry* 33, no. 12 (2014): 2802-2809.

<https://setac.onlinelibrary.wiley.com/doi/abs/10.1002/etc.2744>.

Fort, Douglas J., Kevin Todhunter, Troy D. Fort, Michael B. Mathis, Rachel Walker, Mike Hansel, Scott Hall, Robin Richards, and Kurt Anderson. "Toxicity of sulfide to early life stages of wild rice (*Zizania palustris*)." *Environmental toxicology and chemistry* 36, no. 8 (2017): 2217-2226.

"Grand Portage Reservation Water Quality Standards." Grand Portage Band of Lake Superior Chippewa. Last revised December 7, 2017. <https://www.epa.gov/sites/production/files/2014-12/documents/grandportageband.pdf>.

Huber, James K. "Archaeological implications of pollen evidence for wild rice (*Zizania aquatica*) during the Paleoindian, Archaic, and Woodland periods in northeast Minnesota." In Proc of the Wild Rice Res and Manag Conf. Great Lakes Indian Fish and Wildl Comm, Odanah, pp. 40-53. 2000.

Kjerland, Tonya. "Wild Rice Monitoring Handbook." The University of Minnesota Sea Grant Program. Publication #SH16. 2015. http://www.seagrant.umn.edu/coastal_communities/wildrice

LaFond-Hudson, Sophia, Nathan W. Johnson, John Pastor, and Brad Dewey. "Iron sulfide formation on root surfaces controlled by the life cycle of wild rice (*Zizania palustris*)." *Biogeochemistry* 141, no. 1 (2018): 95-106. <https://link.springer.com/article/10.1007/s10533-018-0491-5>.

Lamers, Leon PM, Laura L. Govers, Inge CJM Janssen, Jeroen JM Geurts, Marlies EW Van der Welle, Marieke M. Van Katwijk, Tjisse Van der Heide, Jan GM Roelofs, and Alfons JP Smolders. "Sulfide as a soil phytotoxin—a review." *Frontiers in plant science* 4 (2013): 268.

<https://www.frontiersin.org/articles/10.3389/fpls.2013.00268/full>.

Lee, P. and J.M. Stewart. "Impact of Sulfate Discharge on the Ecology of Wild Rice Stands at CBSSES. Impact of sulfate discharge from the Clay Boswell Steam Electric Station on the Ecology of Wild Rice Stands in the Mississippi River." Department of Botany, University of Manitoba. July 1978. 262 pp.

Lee, P.F. and P.C. Hughes. "The Effects of Sulfate on the Early Development of Wild Rice." Prepared for Wenck Associates. Lakehead University Environmental Laboratory. 49 pp.

Memo from Dr. John Moyle, Attachment to Memo from Carri Lohse-Hanson, dated March 19, 1987.

Minnesota Office of Administrative Hearings. "Report of the Administrative Law Judge In the Matter of the Proposed Rules of the Pollution Control Agency Amending the Sulfate Water Quality Standard Applicable to Wild Rice and Identification of Wild Rice Rivers, Minnesota Rules parts 7050.0130, 7050.0220, 7050.0224, 7050.0470, 7050.0471, 7053.0135, 7053.0205, and 7053." January 10, 2018.

<https://www.pca.state.mn.us/water/protecting-wild-rice-waters>.

Moyle, John B. "Wild rice in Minnesota." *Journal of Wildlife Management*. 8(3):177-184. 1944.

Myrbo, A., E. B. Swain, D. R. Engstrom, J. Coleman Wasik, J. Brenner, M. Dykhuizen Shore, E. B. Peters, and G. Blaha. "Sulfide generated by sulfate reduction is a primary controller of the occurrence of wild rice (*Zizania palustris*) in shallow aquatic ecosystems." *Journal of Geophysical Research: Biogeosciences* 122, no. 11 (2017): 2736-2753. <https://esajournals.onlinelibrary.wiley.com/doi/abs/10.1002/eap.1452>.

"Natural Wild Rice in Minnesota: A Wild Rice Study." Minnesota Department of Natural Resources. February 15, 2008. https://files.MDNR.state.mn.us/fish_wildlife/wildlife/shallowlakes/natural-wild-rice-in-minnesota.pdf.

Ng, G-HC, A. R. Yourd, N. W. Johnson, and A. E. Myrbo. "Modeling hydrologic controls on sulfur processes in sulfate-impacted wetland and stream sediments." *Journal of Geophysical Research: Biogeosciences* 122, no. 9 (2017): 2435-2457. <https://agupubs.onlinelibrary.wiley.com/doi/abs/10.1002/2017JG003822>.

Norrgard, R., Drotts, G., Drewes. A., and Dietz, N. "Minnesota Natural Wild Rice Harvester Survey: A Study of Harvesters' Activities and Opinions." Minnesota Department of Natural Resources. Division of Fish and Wildlife. Management Section. 2007. p 136. https://files.MDNR.state.mn.us/fish_wildlife/wildlife/shallowlakes/wild-rice-harvester-survey-2007.pdf.

Pastor, John, Brad Dewey, Nathan W. Johnson, Edward B. Swain, Philip Monson, Emily B. Peters, and Amy Myrbo. "Effects of sulfate and sulfide on the life cycle of *Zizania palustris* in hydroponic and mesocosm experiments." *Ecological Applications* 27, no. 1 (2017): 321-336. <https://esajournals.onlinelibrary.wiley.com/doi/abs/10.1002/eap.1452>.

Peacock, Thomas D., and Marlene Wisuri. *The good path: Ojibwe learning and activity book for kids*. Minnesota Historical Society, 2009.

"Point Source Implementation Grants." Minnesota Department of Employment and Economic Development. Last updated June 19, 2018. <https://mn.gov/deed/pfa/funds-programs/point-source-grants.jsp>.

Ramboll. "Draft sulfate standard equation: Options and basis for improvements." May, 2017. 51 pp.

"Reports and Publications." Department of Iron Range Resource & Rehabilitation Board. Last updated 2018. <https://mn.gov/irrrb/media/reports-publications.jsp>.

Schuldt, Nancy, Jennifer Ballinger, Nikki Crowe, Wayne Dupuis, Kelly Emmons, Crystal Greensky, Emily Onello, Kristin Raab, Melissa Walls. "Expanding the Narrative of Tribal Health: The Effects of Wild Rice Water Quality Rule Changes on Tribal Health Fond du Lac Band of Lake Superior Chippewa Health Impact Assessment." Fond du Lac Band of Lake Superior Chippewa. 2018. <http://www.fdlrez.com/RM/downloads/WQSHIA.pdf>.

“Statutes and Rules Relating to Wild Rice.” Minnesota Department of Natural Resources. Division of Fish and Wildlife. Management Section. 2018.

“Statement of Need and Reasonableness: Amendment of the sulfate water quality standard applicable to wild rice and identification of wild rice waters.” Minnesota Pollution Control Agency. July 2017.
<https://www.pca.state.mn.us/sites/default/files/wq-rule4-15i.pdf>.

“Sulfate and Municipal Wastewater: Study Confirms Lack of Affordable Technology. Minnesota Pollution Control Agency. July 2018.
<https://www.eqb.state.mn.us/sites/default/files/documents/SulfateTreatment%20Leg%20Fact%20Sheet%207%2030%2018%20FINAL.pdf>.

“Technical Analysis of MPCA March 2015 Proposed Approach for Minnesota’s Sulfate Standard to Protect Wild Rice.” Prepared by Barr Engineering for the Minnesota Chamber of Commerce. 55 pp.

Vogt, Darren J. "Wild Rice Monitoring and Abundance in the 1854 Ceded Territory (1998-2017)." Duluth, MN: 1854 treaty Authority, A (2018). <http://www.1854treatyauthority.org/management/biological-resources/fisheries/reports.html?id=124&task=document.viewdoc>.

Warren, William W. and Schenck, Theresa M. History of the Ojibway People, Second Edition. St. Paul: Minnesota Historical Society Press, 1984. <https://muse.jhu.edu/book/5404>.

“Water Quality Standards.” Code of Federal Regulations, title 40 part 131 (2018).
https://www.ecfr.gov/cgi-bin/text-idx?tpl=/ecfrbrowse/Title40/40cfr131_main_02.tpl.

“Water Quality Standards.” Minnesota Pollution Control Agency. <https://www.pca.state.mn.us/water/water-quality-standards>.

“Water Quality Standards 101 Documents.” US Environmental Protection Agency, last updated February 8, 2018.
<https://www.epa.gov/wqs-tech/water-quality-standards-101-documents>.

“Water Quality Guidance for the Great Lakes System.” Code of Federal Regulations, title 40 part 132 (2018).
<https://www.ecfr.gov/cgi-bin/text-idx?SID=b1855d1d0ed73f3012fdef51ebd79278&mc=true&node=pt40.24.132&rgn=div5>.

Water Quality Standards Handbook. United States Environmental Protection Agency. 2014.
<https://www.epa.gov/sites/production/files/2014-10/documents/handbook-chapter2.pdf>.

“Water Quality Standards of the Fond Du Lac Reservation Ordinance #12/98.” Fond du Lac Band of Lake Superior Chippewa. Last revised September 11, 2001. <http://www.fdlrez.com/RM/downloads/WQSDraftCopy.pdf>.

“Water Quality Standards Variance Building Tool.” United States Environmental Protection Agency. August 2017.
<https://www.epa.gov/wqs-tech/water-quality-standards-variance-building-tool>.

"Wild Rice Seeding Guidelines." US Department of Agriculture. Natural Resource Conservation Service. Biology Jobsheet #14. 2004. https://efotg.sc.egov.usda.gov/references/public/MN/jobsheet-14_wild_rice_seeding_guidelines_644.pdf.

"Why Treaties Matter Exhibit." Clean Water, Land, and Legacy Amendment, Minnesota Humanities Center, Minnesota Indian Affairs Council and Smithsonian National Museum of the American Indian. <http://treatiesmatter.org/exhibit/>

Yost, Chad L., and Mikhail S. Blinnikov. "Locally diagnostic phytoliths of wild rice (*Zizania palustris* L.) from Minnesota, USA: comparison to other wetland grasses and usefulness for archaeobotany and paleoecological reconstructions." *Journal of Archaeological Science* 38, no. 8 (2011): 1977-1991.

DRAFT