

Wild Rice Standards Study Advisory Committee Meeting Summary (updated)

5/18/2015

1:30-3:30 p.m.

Advisory Committee attendees: Kurt Hoffman, Jon Docktor, Anne Nelson, Len Anderson, Nancy Schuldt, Jennifer Engstrom, Darren Vogt, Sara Barsel, Mike Hansel (for Robin Richards), Kathryn Hoffman, Paula Maccabee, Tracey Ekola, Rob Beranek, Peder Larson (for David Smiga), Joe Mayasich, Shane Bowe

Others: Lea Foushee, Bob Tammen, Pat Tammen, Margot Monson, Betsy Daub, Howard Markus, Craig Pagel, Chris Wagener, Kathy Mayo, Paul Proto, Stephanie Hemphill, Katrina Kessler, Shannon Lotthammer, Ed Swain, Gerald Blaha, Phil Monson, Pat Engelking, Carol Nankivel, Liz Kaufenberg, David Bael

Katrina Kessler welcomed everyone to the meeting and provided some background information and a timeline explaining where we are currently at in the process. Following the background slides, several items related to the MPCA's draft proposal were presented and discussed:

1. Discussion of Wild Rice Waters and Draft list of Wild Rice waters

Katrina Kessler explained the MPCA's draft definition of wild rice waters that is based on a stem count threshold and showed a photo example. She also provided some explanation of how the draft wild rice waters list was derived, and showed a list of sources used to identify the waters on the draft list. Katrina also described the way that MPCA used the 2008 DNR Wild Rice report when pulling together the list. Given that historically stem counts have not been widely collected, MPCA automatically added in all wild rice waters that were 2 acres or more in size and then looked for additional information to add other waters from the report onto the MPCA's draft list of wild rice waters.

Advisory Committee questions on Wild Rice waters: Advisory committee members had several questions and comments about the definitions and the draft list. Rob Beranek commented that the 2011 wild rice legislation mentioned waters including irrigation waters and natural stands of wild rice and wondered how the MPCA was planning to address irrigated waters. Katrina answered that the MPCA's proposal would not cover farmed (paddy) rice and that the MPCA was planning to have a new class of waters for wild rice, which would be Class 8. She commented that the MPCA thought the paddy systems are quite different from natural rice stands and that it would not be appropriate to apply the same standard to paddies and natural stands. Jon Docktor from the Minnesota Cultivated Wild Rice Council agreed the systems were very different and noted that paddy rice was often part of a rotation with other crops.

Advisory committee members discussed with the MPCA whether putting wild rice waters in a Class 8 category would afford more or less protection than placing the wild rice waters as Class 2 waters. The MPCA clarified that many waters in the states have more than one class—a water could be classified as both a Class 2 and Class 8 water.

Other questions centered around the MPCA's draft definition of wild rice water. Advisory committee members asked if there was a legal basis for wild rice waters needed to be "self-perpetuating" and if there was a scientific basis for 8,000 and 800 wild rice stems for lakes and rivers, respectively. Several advisory members and other observers further clarified their concerns about the definition and these thresholds in e-mails shared with the advisory committee (see e-mails from Len Anderson, Robert Shimek, Anne Nelson, Paula Maccabee, North American Water Office and Friends of the Cloquet Valley State Forest.) MPCA commented that the original standard was based on "production" not "presence" and that the MPCA was directed by the Legislature in 2011 to consider density when drafting the list of wild rice waters. Gerald Blaha talked about the term "production" in the phrase "water used for production of wild rice". An analogy of the term's use in "waterfowl production areas" was made. (Post meeting note: The term "production" and the phrase "producing area" are widely used to describe both natural and paddy wild rice in a Minnesota Resources Commission staff report to the Minnesota Legislature titled *A Study of Wild Rice in Minnesota*, (M.R.C. Staff Report No. 14, F. Robert Edman, 1969, p. 132.)

One advisory committee member asked about the 1973 rule adopting the wild rice sulfate standard and Gerald Blaha said that originally the standard was proposed to apply to all waters of that state but that during rulemaking this was changed to “water used for production of wild rice.”

Considerable discussion revolved around why the MPCA did not automatically add all of the wild rice waters in the DNR 2008 report to the draft list, especially since acreage and density were not requested for that report. Some advisory committee members thought that the two-acre threshold used by agency to screen waters was arbitrary. An advisory committee member suggested that all the waters should be listed and then removed if evidence was found that a listed water was not a wild rice water. Katrina Kessler commented that going forward the MPCA would rely on stem count rather than acreage but that there is not a lot of information available on stem count from the past.

Kathryn Hoffman asked about a map showing waters with wild rice shown by Barr Engineering at another meeting. Mike Hansel replied that the map was produced using the DNR's 2008 wild rice waters list.

Questions from other people not on the advisory committee: Howard Markus commented that the “potential to grow wild rice” should be part of the definition and he was concerned that the current standard proposal would be grandfathering in pollution. He indicated that the “potential” wild rice areas could be determined through the historical record, noting for example that historical information about the Minnesota River references observations of abundant wild rice. He suggested MPCA contract with the Minnesota History Center to explore the historical record and accept mention of wild rice in the historical record as adequate evidence to include a water on the draft list of wild rice waters. Howard also identified a need to broaden any water quality standard to include more than just a concentration-based number—the narrative side of the water quality standard.

2. Presentation of Proposed Approach by Edward Swain

Following the wild rice waters discussion, Katrina Kessler suggested that Ed Swain update the committee on what the MPCA did in response to the findings of the peer review panel and then take a few questions. Following that, MPCA would reserve some time to discuss the MPCA's wild rice monitoring this summer as well as next steps. The advisory committee agreed this was a reasonable approach. Ed Swain reviewed what MPCA had done in response to the peer review report. Specifically, for the hydroponic experiments, the MPCA reanalyzed the data using an EC10 rather than EC20, which the reviewers concluded would not be protective of wild rice. MPCA also calculated EC10 values based on time-weighted sulfide concentrations in addition to initial concentrations. For the mesocosm experiments, MPCA reanalyzed the plant responses relative to actual sulfate and sulfide exposure rather than nominal. The MPCA has also contracted for the development of a population model to better understand factors influencing population persistence. Ed noted that this work is underway but not yet complete. For the field survey data, based on recommendations of the peer reviewers, the MPCA: 1) performed additional statistical analyses on the data; 2) reanalyzed the data using stems/m² rather than presence/absence; and 3) analyzed the data using structural equation modeling (SEM) to better evaluate the interactions of the environmental variables.

Questions and discussion from Advisory Committee Members

Advisory committee members asked for more detail about the population modeling. Ed replied that it is being conducted by a post doc at the University of Minnesota, Laura Phillips-Mao, using RAMAS software. The modeling is based on the response of wild rice to sulfide concentrations from the 2013 mesocosm data. It is planned to compare the RAMAS-modeled probability of wild rice extinction at particular sulfide concentrations to the binary logistic regression-determined probabilities determined from the field survey data.

Other advisory committee questions revolved around the use of an EC10 in the MPCA's proposal, and what was the basis for this. Ed replied that this was recommended by the peer review and that it was a judgment call to use the EC10 over the EC5, and that the MPCA found the EC5 analysis to be less certain statistically. Other advisory committee members wondered why the peer review members did not think that the EC20 was not protective

enough as sometimes an EC50 is used. Another question focused on whether the .486 exponent in the model equation would change. Ed Swain answered no that the exponent would not change.

Another advisory committee member asked if maybe the paddies should be included because the early life stages of wild rice are likely the most sensitive. Ed Swain commented the paddies were excluded because they were drawn down during the summer and that early life stages were not necessarily the most sensitive for wild rice as the hydroponic experiments found germination not sensitive to sulfide.

See the e-mails from Paula Maccabee and Robert Shimek that elaborate further on advisory committee concerns about the MPCA's proposed approach.

Comments from others not on the advisory committee: Howard Markus commented that the proposed equation was developed including impacted streams and he had a concern that iron contributed by human activities was present in the system. He suggested that the standard should be derived using least impacted sites.

Given the detailed dialogue at the meeting, which was welcomed, the MPCA was not able to get through all of the presentation. The presentation will be continued at the next advisory committee meeting.

Discussion of MPCA summer monitoring—MPCA and the advisory committee members had a discussion about the MPCA's pilot monitoring proposal. Phil Monson noted that part of the purpose of the monitoring is to get a sense of the spatial variability of iron and carbon within a wild rice site. The MPCA is interested in feedback on how many samples are needed, should a mean or median value be used to characterize a site, what methods should be used to analyze the results, etc.

Advisory members expressed concern about the variability between values for parameters for samples taken at the same site. Nancy Schuldt from Fond du Lac suggested that the MPCA use the methods published by Tonya Kjerland to ensure a broad spatial and temporal set. Advisory committee members asked if surface water samples would be taken as well as sediment samples. MPCA said yes but that we were not planning to take any porewater samples. Mike Hansel noted the Chamber of Commerce recommended that the MPCA measure redox potentials in the sediment along with pH. Katrina Kessler noted the MPCA will be meeting with Minnesota DNR as well to discuss wild rice monitoring as well and that any additional comments would be welcome.

Next Steps for Advisory Committee—In the last few minutes of the meeting, Shannon Lotthammer noted that the advisory committee likely had many more questions and that she would like thoughts about how to structure the discussion and how long the meetings should be. Also, she asked if people would like to continue alternating the location of the meetings between Duluth and St. Paul. A suggestion was made the MPCA should organize each of the next discussions around a broad topic area so there is time for a complete discussion. Examples of these topics could be definition of wild rice waters, monitoring and assessment, the numeric standard and population modeling. Advisory committee members commented that it would be good to continue to alternate locations between St. Paul and Duluth every other time.

MPCA agreed to send out more information on the population modeling. (See attached for a one-page summary). MPCA will also post written pre-rulemaking comments on its web page soon.

Leonard Anderson
June 04, 2015 8:08 PM

You are correct in stating that we had a question about the scientific basis for the use of "8,000 and 800 stems". However, the sentence that follows that sentence does not address our concerns at all. There is extensive literature on population genetics that should be referenced. Pulling numbers out of the air does not constitute a "scientific basis". Thank you.

Paula Maccabee
June 5, 2015 9:01 AM

Good morning:

WaterLegacy shares Len Anderson's concerns that the meeting "summary" from the May 19 Wild Rice Advisory Committee provided with the email below poorly reflects the nature of the concerns regarding the definition of wild rice waters. From our perspective, the summary also omits or mis-states the many substantive concerns raised by Committee members regarding the proposed MPCA methodology for controlling sulfate effluent in those waters.

WaterLegacy took detailed notes at the meeting on May 19, 2015. We will prepare and distribute a summary of the various concerns and issues that were raised by Committee members prior to the next Committee meeting.

In the future, we would request that the MPCA either make a commitment to more completely and accurately record the comments of Committee members and public participants. Perhaps some method of recording proceedings would be appropriate if MPCA does not intend to provide a more accurate and candid record of the concerns raised.

Sincerely yours,

Lea Foushee
June 6, 2015 2:50 PM

This is not the first example of "white-washing" of the facts in the MPCA meeting minutes. Participants should not have to "call out" the Agency to get real minutes. NAWO concurs with WaterLegacy and Mr. Anderson.

Shannon Lotthammer, shannon.lotthammer@state.mn.us
June 5, 2015 10:45 AM

Thank you all for your efforts to make sure our notes from the meetings are accurate. We do our very best to accurately summarize the conversation. Given that this is a summary, there may be times like the present when there is a concern that we did not capture a key point that one or more people made at the meeting. When that occurs, we welcome your feedback so we can update the summary (which we will do in this case; we will send out an updated version soon). We also welcome you all to share your notes from the meetings.

We do not have the resources to record or develop a transcript of each meeting. The intent of these notes is to summarize the main topics of the conversation for the benefit of those who were not able to attend. Again, we welcome your feedback if we missed something, and of course we also welcome your comments about the proposed approach at or between meetings.

Kind regards,

Kristin Larsen

June 5, 2015 2:26 PM

Friends CVSF also suggests there should be a period of time over which you observe lakes and documentation of seeding wild rice by DNR and others should accompany this. There is at least one lake on that list at with no history of wild rice, aggressive seeding and subsequent die off listed as a natural wild rice lake.

Robert Shimek

June 5, 2015 3:10 pm

The discussion about wild rice waters is stupid. Anybody who has spent a reasonable amount of time hand harvesting wild rice knows that a lake may be full one year and sparse and thin the next due to a variety of conditions. Some lakes may be sparse and thin for 5 years than be full. I have seen lakes full one day and mostly empty the next day. Can the staffing and scientists of the MPCA tell us all why?

The point being I can wait for a year when a normally reasonable lake for whatever reason doesn't grow much rice one year and sacrifice it to industry and the mines. Or if there are 2 - 4 years of flooding that reduces the rice, a decent lake gets sacrifices to the mines. Most reasonable people recognize that one of the impacts of climate change is the more frequent occurrence of above normal precipitation events. This causes more frequent flooding. Months ago, I asked that the impacts of climate change be factored into our deliberations. There was some concurrence that flooding at the mines and sewage treatment plants can cause the unintentional discharge of sulfate and other harmful chemicals and metals into the environment.

Who does long term monitoring to see what happens when the iron that mitigates the formation of sulfide is all sequestered up and there is nothing left to prevent the formation of sulfide? And who decides when the rice beds are filling in at an abnormally high rate with decaying plant life?

It appears to me that we are looking for ways to get rid of naturally occurring stands of wild rice rather than find ways to save them or revitalize those already compromised. It appears to me that again, the MPCA is protecting the polluters rather than the common wealth of Minnesota which includes clean water and wild rice. On whose authority do we continue to pollute the waters and kill the wild rice?

We know what level sulfate discharge is protective of wild rice. Now, let's turn it all into a scientific equation and hope we are right? Has it occurred to anybody that this is the only place in the world where conditions are such that we can have wild rice? We are going into untested areas here and using one of our states most precious resources to conduct a new experiment to see if it works. Natural wild rice is also a huge economic asset for tribal people in Minnesota. If it was a huge economic asset for white people in Minnesota, we would not be having this conversation. We will not get a second chance at all this.

Please feel free to remove me from this list anytime.

Katrina Kessler, katrina.kessler@state.mn.us

June 5, 2015 19:13:03

Hi Len

We appreciate you taking the time to properly characterize your comments about the proposed stem threshold within the draft definition of a wild rice water. To help us further understand your comment, will you please send us the citations for the particular articles/sources that you would like us to reference? Without specific citations it is hard for us to know whether we have already considered the articles you are suggesting. Again, we appreciate your comments and especially your efforts to help us refine the draft proposal. Once we have had a chance to review your suggestions we will follow up with the advisory committee at a future meeting or via email.

Many thanks!

Lea Foushee

June 6, 2015 2:49:42 PM

This is very well said Mr. Shimek. The meetings without someone such as yourself, are a sham, for the record....

Anne Nelson

June 6, 2015 9:16 PM

Thank you Mr. Shimek for your comments. As a hand harvester myself, I concur with your comments. There are indeed several places where my partner and I have harvested in the past. One year there is plenty of rice and the next year there is nearly nothing. I am very concerned that the definition proposed is not sufficiently flexible to account for all populations of wild rice.

Thank you

Paula Maccabee

June 8, 2015 8:34 PM

Hello Committee Members, Agency Staff, Public Participants:

Water Legacy joins other Wild Rice Advisory Committee members to communicate our disappointment that the nature and multiplicity of concerns raised at the May 19, 2015 meeting regarding the MPCA's approach both for the definition of wild rice waters and for the process of addressing excess sulfate discharge were not reflected in the MPCA staff summary.

Attached, please find our own much more detailed summary of concerns raised by Committee members and public participants in the May 15, 2015 Committee meeting.

We are providing this more complete summary of concerns not only to ensure that the record is accurate, but in the hope that concerns of Advisory Committee members and public participants will be addressed by the MPCA. If concerns are not candidly acknowledged, there is little prospect that serious effort will be made to address those concerns in a substantive manner.

Please feel free to contact me if you have any questions about our summary or our perspectives.

Sincerely yours,

MPCA Wild Rice Advisory Committee

Summary of Concerns of Committee Members and Public Participants May 19, 2015¹

Wild Rice Waters Definition Concerns

- MPCA has not provided any legal basis for the definition that wild rice must be self---perpetuating in order to be protected. (P. Maccabee, WaterLegacy)
- MPCA has not provided any factual basis for the definition that there must be 8,000 stems for wild rice beds in lakes, 800 stems over a river mile or approximately two stems per meter. (Several commenters)
- MPCA has provided no peer reviewed literature to support this definition. No peer---reviewed literature on population dynamics was included in the bibliography. A science---based decision on the number of stems required for protection of wild rice must be based on peer---reviewed literature on population dynamics. (L. Anderson, Committee Member)
- The evidence in this record, from several years of mesocosm wild rice self---perpetuation would seem to contradict the assumption that 8,000 stems would be needed in a lake for wild rice to be self---perpetuating. (P. Maccabee, WaterLegacy)
- None of the MDNR data or other lists from which wild rice waters were derived contain stem count information. The assumption (Shannon Lotthammer) that two acres would serve as a proxy for 8,000 stems is not factually supported. (K. Hoffman, MCEA)
- Whether a two---acre threshold is used as a proxy 8,000 stems or is simply imposed as a threshold, there has been continuing and widespread objection that such an acreage threshold is not protective of wild rice. (Several commenters)
- MPCA has provided no rationale for designating a unique class for protection of wild rice, rather than including the wild rice as another category of aquatic life standards in Class II waters. (N. Schuldt, Fond du Lac)
- MPCA has provided no justification for excluding any of the 1,286 wild rice waters identified in the Minnesota Department of Natural Resources (MDNR) 2008 report to the legislature. (Several commenters)
- The MDNR data was legislatively directed, was intended to inform the State as to where wild rice was present and at risk, is compatible with MPCA approach, and should be used. (N. Schuldt, Fond du Lac)
- Restricting wild rice waters to sites with wild rice acreage of two acres or more can be very arbitrary. Even some of the sites used for harvest of wild rice can be small in acreage, but quite dense. (L. Anderson, Committee Member)
- The MPCA's definition of wild rice would not reduce uncertainty; it would increase uncertainty. (P. Maccabee, WaterLegacy)

¹ This summary was compiled by WaterLegacy Advocacy Director and Counsel, Paula Maccabee (pmaccabee@justchangelaw.com) on June 8, 2015 based on detailed electronic notes of the proceedings. It reflects the author's perception of the questions and concerns of various participants.

Wild Rice Sulfate Standard Approach Concerns

- MPCA analysis doesn't attempt to measure the effect on wild rice and doesn't reflect the potential for population extinction over time, since it only looks at a single point in time and whether wild rice is "present" or "absent." Mesocosms where sulfate was added show population change and extinction over time. (P. Maccabee, WaterLegacy)
- Application of the EC10 nomenclature to the MPCA's formula is not appropriate. The statistical methodology looking at wild rice presence or absence in the field is not equivalent to a no observed adverse effects level (NOAEL) or a no observed effects level (NOEL). (P. Maccabee, WaterLegacy)
- MPCA analysis insufficiently reflects mesocosm data and prediction of sulfate and sulfide. (H. Markus, Public Participant)
- MPCA has no experimental data on the effects of adding both iron and sulfate or the effects of iron sulfide precipitate on the growth and persistence over time of wild rice. (P. Maccabee, WaterLegacy)
- MPCA should disclose at what level of sulfide a 5% effect on the presence of wild rice presence was identified and justify the use of any level above 5% to protect wild rice from extinction. (K. Hoffman, MCEA)
- MPCA's presentation to the Committee omitted the slide on page 14 of the MPCA's March 24, 2015 Report² that showed a scatter of predicted sulfide to sulfate. Data showing the poor fit of prediction of sulfide using MPCA equation should have been shared with the Committee. (P. Maccabee, WaterLegacy)
- Use of excess iron from anthropogenic sources to justify more sulfate discharge is inappropriate regulatory practice; any standard should be based on background unimpacted waters. (H. Markus, Public Participant)
- MPCA equation approach doesn't consider extreme variability of chemistry over time and over spatial area. Variability is a big red flag for implementation and appropriateness of the approach. (N. Schuldt, Fond du Lac)
- Data sets with consistent monitoring methodology over the long term have the greatest power, Tonya Kjerland's published method for monitoring wild rice stand density should be used statewide. (N. Schuldt, Fond du Lac)
- MPCA's proposed approach lacks legal, regulatory, or scientific peer---review support or documentation. (Several commenters)

² MPCA, *March 2015 proposed approach for Minnesota's sulfate standard to protect wild rice* (March 24, 2015) Figure 9. Modeled porewater sulfide concentrations (based on Equation 2) compared to observed porewater sulfide for the data that was used to calibrate the model.

Len Anderson

June 8, 2015 9:41 pm

Katrina, thanks for the opportunity to further clarify my thoughts. Attached you will find my thoughts on why I think defining a stand as 800 or 8,000 stems is not protective enough.

Protecting the genetic diversity of wild rice

In our last wild rice research advisory committee meeting we discussed “what constitutes a wild rice stand”. Do the stands on the Partridge and Embarrass River constitute a “stand” of wild rice? I am sure the ducks think they do. If PolyMet can get these stands in effect “declassified” as a stand, then they are home free. The same could be said for Mnntac and Western Lake Superior Sanitary District and many others. So the stakes are high and demand a science based criterion.

A critical consideration in application of the state wild rice sulfate standard is defining what constitutes a stand of wild rice. Is it one plant, or a thousand, or an acre? Because of the various threats to a continued presence of wild rice in this state, such as climate change, invasive species, shore line development, changing water use and pollution, we should err on the conservative side. That means protecting small isolated populations of wild rice for their critical stores of divergent genetic information. In the decades ahead, this special plant will be stressed to the point that it will either adapt and evolve, or possibly vanish from the state. It cannot adapt without genetic diversity.

A half a century ago, E.O. Wilson and Wright demonstrated the significance of isolated island populations to the evolution of new species. We now know that the same mechanisms of isolation, inbreeding and genetic drift are at work in small isolated plant populations with limited mobility and limited pollen dispersal in bog, mountain top, and headwater populations. These are now considered “island populations”. From the Theory of Island Biogeography—University of Windsor, Canada, we read, it is clear “islands take many forms” and “there is little or no gene flow to dilute the effects of selection and mutation. Endemism is rampant. Fragments of habitat are important as sanctuaries”. I would add that they are sanctuaries of critical genetic stock. The small sustaining populations of wild rice in headwater isolation are sanctuaries of genetic stock.

Genetic drift is the prime force at work on these populations. According to the Hardy-Weinberg principle, gene frequency will remain constant in the absence of selection, mutation, migration or genetic drift. According to Dr. David Fitch, New York University, the smaller the population size (N) the faster the genetic drift. Therefore the variance between demes (small subpopulations) increases over time. Demes will diverge, especially if they become isolated. Genetic divergence results between populations. Fortunately, in Minnesota we have thousands of these genetically diverse isolated populations of wild rice. The same can be said for Wisconsin. In the American Journal of Botany (Yingqin 2005) in the article, “Genetic variability is correlated with population size and reproduction in American wild-rice (*Zizania palustris* var. *palustris*, Poacea) populations”, we read, “Estimated genetic differentiation among the 17 populations (FST) was high (0.30), suggesting limited gene flow between drainages”.

Isolation in this sense means interrupted gene flow between subpopulations. The chance of genetic transfer between these small populations of wild rice could be by way of transfer of viable seeds or pollen. Ducks have been observed with *Limna minor* attached to a feather, but to my knowledge, not wild rice. Overland movement of fur-bearers does occur between sub-watersheds, but they keep their coats meticulously clean. Viable seed transfer and therefore gene flow, probably occurs rarely.

Viable pollen transfer is the other mechanism controlling gene flow. Wild rice is a wind pollinated grass. The distance over headwater divides and therefore between wild rice populations is at least a few miles. In the American Journal of Botany (Franks, 2004) in “Multi-scale genetic analysis of *Uniola paniculata* (Poacea)”: a coastal species with a linear, fragmented distribution, the authors say, “In summary, several conclusions can be drawn from the patterns of genetic variation and structure in Uniola paniculata. First, the degree of genetic differentiation among populations and the relationship between geographic and genetic distance indicate that this species experiences moderate barriers to gene flow, which is consistent with expectation for a species with a linear, fragmented distribution.” I think this description is a good fit with wild rice.

Specifically, with regards to pollen transfer of genetic material, an article in Plant Ecology (2005) by Sarah M. Eppley, titled “Spatial segregation of the sexes and nutrients effect reproductive success in a dioecious wind-pollinated grass”, we read, on p.184, she considers 40 meters downwind to be long-range pollen dispersal in the species *Distichlis spicata*. Also on p.185 she said, “In these areas, the number of pollen grains on stigmas dropped by over 30% in just 1 m.” Also in “Wildrice and forest history at Lake Ogechie in Minnesota” by J.H. McAndrews(2006), he mentioned, “As might be expected, grass pollen is super abundant in surface sediments beneath a rice stand and progressively declines with increasing distance from the stand.” In the poster, Wild Rice Pollen Travel (Co3-creagan140607), she got 20%

pollination at up to 1,600 m. It would appear that pollen transfer from wild rice in one drainage system to another drainage system would be exceedingly rare.

It is clear that the many wild rice stands in the hundreds of small sub-watersheds are unique in their genetic composition and therefore need to be protected under the state wild rice standard of 10 mg/L or any new metric that may be applied. To quote from *Natural Wild Rice in Minnesota*, MDNR 2008, "The genetic variability that exists today in natural wild rice may be a critical determinant of whether stands of wild rice can adapt to long-term changes in regional climate. There is strong agreement among stakeholders that it is critically important to maintain the genetic diversity of natural stands of wild rice."

Respectfully submitted,

Howard Markus

June 9, 2015 15:12:02 PM

Good morning Pat *et al* - I appreciate the summary nature of the minutes but I would like to add a little to the following comment summary of mine:

Questions from other people not on the advisory committee:

Howard Markus commented that the "potential to grow wild rice" should be part of the definition and that the Minnesota River at one time had lots of rice. He said he was concerned that the current standard proposal would be grandfathering in pollution.

The "potential" wild rice areas can best be determined through the historical record. The "Minnesota River" was one example of the large history available. I suggested that the MPCA contract with the Minnesota History Center [<http://www.minnesotahistorycenter.org>]. As another example, most "Rice" lakes and rivers are probably not named after people. The Agency should explicitly state that mention of wild rice in the historical record is adequate to place that resource in the Wild Rice List of waters - if it wasn't enough to harvest, it would not be worth mentioning.

Associated with the concept of "potential" is the need to broaden any WQS to include more than just some concentration-based number -- the narrative side of the WQS.

Thank you for your patience.