

## Upper Mississippi River Conservation Committee Water Quality Technical Section 2013 Fall Meeting

Lucille A. Carver Mississippi River Environmental Research Station, Fairport, Iowa

### Agenda

Afternoon September 24

- Welcome and introductions
- UMRCC Coordinator's Update  
Scott Yess, US Fish and Wildlife, Onalaska, Wisconsin
- Mayfly Emergence Network Update  
Mark Steingraeber, US Fish and Wildlife, Onalaska, Wisconsin
- Research and Applications on Ecosystems at LACMRERS – Integration of physical, chemical and biological processes across different scales through modeling and sampling  
Oscar Hernandez, IIHR – Hydroscience and Engineering
- MNRRA WQ Trends Report  
Kent Johnson, Metropolitan Council Environmental Services

Social hour at LACMRERS with our potluck of local favorite fare – honor John Sullivan for his steadfast support of the Water Quality Technical Section and the Mississippi River

Morning September 25

- UMRBA Water Monitoring Strategy Update and Discussion  
John Olson, Iowa Department of Natural Resources
- Cedar and Iowa River Mussels: Biomonitoring and Nutrient Processing  
Lee Hauser, IIHR – Hydroscience and Engineering
- Brief history of the Fairport fish hatchery  
Bernie Schonhoff, Hatchery Director
- State of the River Report – indicators and presentation  
Kent Johnson, Metropolitan Council Environmental Services

Adjourn

### Attendees

Elizabeth Bruns, Leo Keller and Karen Hagerty (USACE); Scott Yess and Mark Steingraeber (USFWS); John Olson and Bernie Schonhoff (Iowa DNR); Matt Short and Gregg Good (Illinois EPA); John Sullivan (Wisconsin DNR); Shawn Giblin (Wisconsin DNR/LTRMP); Kent Johnson (Metropolitan Council); Dru Buntin and Dave Hokanson (UMRBA); Craig Just, Lee Hauser and Oscar Hernandez Murcia (U of Iowa); Pete Redmon and Bill Franz (informed citizens); Louise Hotka (MPCA).

## Presentation Summaries

### Mayfly Emergence Network Update

Early analysis of 2013 reports from network observers along Pool 2 to 16 fit pretty well the Wright model using Cumulative Temperature Units of Development (CTUDs) to predict mayfly emergences. Results from MCES working with L&D2 personnel remain to be reported. These include Ponar dredge samples looking for nymphs to investigate why there are fewer adults in the Twin Cities Metro area. From a network standpoint, more observers along certain areas would be useful and some observers responded to prompting to report in. Funding (~\$10K) is needed to take the network to the next

level. <http://www.fws.gov/midwest/lacrossefisheries/programs.html>

### Research and Applications on Ecosystems at LACMRERS – Integration of physical, chemical and biological processes across different scales through modeling and sampling

Oscar Hernandez a PhD student in the LACMRERS modeling group overseen by Doug Schnoebelen at IIHR-Hydroscience and Engineering, University of Iowa, presented his work to date on 3-D model using OPENFOAM software. This is open source code software available to the scientific community. The model is combining the hydrodynamics with chemistry to solve both sets of equations at the same time in 3-D space and time. The new model will provide biologists and managers a tool to look at nitrate processing scenarios in river reaches and pools of the Mississippi River. Early results on Round Lake (backwater lake in Pool 8 of the Mississippi River near La Crosse, WI) showed good results. It has been a breakthrough in that for the first time the hydrodynamics and chemistry can be run at the same time. The chemical part of the process is accurately portraying nitrate in the nitrogen cycle currently using 8 equations and 45 coefficients. Equations from nitrogen cycle using such variables as temperature, dissolved oxygen, algae have been incorporated. Variables such as residence time and travel paths of chemical constituents were shown.

The model now includes modules with (POC, PON, POP, DON, DOC, DOP, NH<sub>4</sub>, NO<sub>3</sub>, DO, algae) chemical equations that influence nutrient processing. Currently the model is being calibrated using average values for species concentrations. Also an additional sub model is being developed to define appropriate boundary conditions at the water-sediment interface when sample data is available.

The LACMRERS group also has now built **two separate models for Pool 8 (historic and modern)**. The objective was to compare flow patterns between the two conditions (historic and modern). There was also land cover on the historic (1890) river map (as defined by the USGS-EMESC from this map) so that Manning's n numbers could be assigned for the historic model of Pool 8 using actual historic land cover data. In general, the models (historic and modern) reproduce characteristic hydrodynamic features of Pool 8 for both cases. The LACMRERS group is hoping to advance hydrodynamic models of the river for researchers, managers, and the Mississippi River community.

## MNRRRA WQ Trends Report

The Mississippi National River and Recreational Area (MNRRRA) spans a highly visible and highly developed stretch of the Mississippi River within the Twin Cities Metropolitan Area. Water quality has been a long-standing concern for managers and the public, and many monitoring programs and research studies addressing water quality have been developed. Although various agencies monitor water quality in the region, there have been few efforts to analyze water quality data over the long term or for the entire MNRRRA corridor. The Metropolitan Council Environmental Services (MCES) has been collecting water quality data at fixed river stations in the Twin Cities Metropolitan Area for more than thirty years, making a robust data set for analyzing trends over time. The authors compiled thirty years (1976-2005) of year-round MCES monitoring data for six Mississippi River sites within MNRRRA, a nearby Minnesota River site, and the Metropolitan Wastewater Treatment Plant outflow. Flow and a variety of water quality variables (water temperature, dissolved oxygen, pH, specific conductance, nutrient and sediment-related variables, and chlorophyll-*a*) were analyzed to 1) characterize longitudinal patterns within the corridor, 2) evaluate long-term seasonal patterns, and 3) assess interannual trends over the period of record. This type of report can provide the bases for other presentations, such as the State of the River Report, which is designed for ease of use by the general public.

This report is available from the Natural Resource Publications Management website:

<http://www.nature.nps.gov/publications/nrpm/>

Please cite this publication as:

Lafrancois, B. M., S. Magdalene, D. K. Johnson, D. VanderMeulen, and D. Engstrom. 2013. Water quality conditions and trends in the Mississippi National River and Recreational Area: 1976-2005. Natural Resource Technical Report NPS/GLKN/NRTR—2013/691. National Park Service, Fort Collins, Colorado. <http://irmafiles.nps.gov/reference/holding/466921>

## UMRBA Water Monitoring Strategy Update and Discussion

The UMRBA Water Quality Task Force has chosen a monitoring design framework for the roughly 850 miles of the UMR to support Clean Water Act Section 305(b) assessments for four designated uses (aquatic life, drinking water, aquatic recreation and aquatic consumption). The design is probabilistic based on four longitudinal assessment reaches focusing on main and side channel lateral strata for the near term. Existing monitoring efforts are recognized in the design and not duplicated. Monitoring would be conducted over a two year period and repeated in 5 year cycles. Confidence in the program may build sufficiently in time to develop a consensus to use the assessments for 303(d) as well, but funding to initiate the effort is still to be identified. [John's presentation](http://www.umrba.org/wq.htm) is posted on the UMRBA Web site: <http://www.umrba.org/wq.htm> .

## Cedar and Iowa River Mussels: Biomonitoring and Nutrient Processing

To understand the dynamics of mussel feeding on nutrient concentrations and the impact of nutrient concentrations on mussel health, the IIHR is conducting monitoring of mussels and water chemistry in river bed pore water.

The monitoring work is conducted on mussels in cages in the Cedar and Iowa Rivers, as well as in the lab with a portion of the Iowa River flowing through tanks.

#### Brief history of the Fairport fish hatchery

The Iowa DNR Fairport fish hatchery site adjacent to the LACMRERS was first used for a mussel research lab established to study the propagation of mussels after decimation of extensive Mississippi River mussel beds by over-harvesting for the button industry 1886-1925. By 1929, mussel propagation ceased and the hatchery has been used primarily for fish production since. Research at the Fairport site produced new information about mussel and fish reproduction, and of the ground-breaking techniques developed there, some are still in use today. It was originally a federal research laboratory and for a time, was considered to be a Woods Hole of the Midwest for many years. A succession of laboratory buildings eventually closed for research during the Depression, and later served as a residence for youth, WWII POWs and their guards, and the elderly ministered by a church group. The pond near the entrance is in current use for mussel studies and can be seen in one of the historic photographs of the first permanent laboratory building in 1914. Contact [Bernie Schonhoff](#) to see his impressive presentation with photos.

#### State of the River Report – indicators and presentation

The Friends of the Mississippi River and the National Park Service teamed up with input from monitoring organizations to create this attractive report for the general public. While based on scientific reasoning with solid monitoring results, the presentation goes beyond the usual dry reporting approach to use indicators recognizable to most people. The printed report employs highly communicative graphics and is designed to for easy online reading. <http://stateoftheriver.com/>

#### **Organization Updates**

##### Scott Yess, UMRCC Coordinator's Update

The UMRCC budget would support small expenditures on research projects or mission related efforts, so the WQTS should consider proposing for good ideas.

##### U.S. Army Corps of Engineers - Rock Island Water Quality and Sedimentation Section

Dave Bierl: Over the summer we performed **baseline monitoring at three HREPs** (Pool 12 Overwintering, Beaver Island in Pool 14 and Huron Island in Pool 18) and performance evaluation monitoring at five HREPs (Brown's Lake, Potter's Marsh and Spring Lake in Pool 13; Lake Odessa in Pools 17/18; and Banner Marsh in the LaGrange Pool of the Illinois Waterway. High water experienced early during the sampling season quickly gave way to low water conditions as the season progressed.

Section members currently serve as team members on product delivery teams for the **Pool 12 Overwintering, Beaver Island (Pool 14), Huron Island (Pool 18) and Starved Rock Pool (Illinois Waterway) HREP/519 projects**. A contract has been awarded and construction on the Pool 12 Overwintering project is likely to commence this fall or next spring.

**Transparency tube measurements at Rock Island District Mississippi River Lock and Dams** were taken during the growing season. As in the past, these measurements were performed voluntarily by district L/D personnel. Contact: David P. Bierl, (309) 794-5581, Fax: (309) 794-5584, [david.p.bierl@usace.army.mil](mailto:david.p.bierl@usace.army.mil)

Minnesota Pollution Control Agency

*New water quality standards*

**River nutrient standards** for total phosphorus and response variables are on track to be promulgated in November to start the required process of hearings and comments, with a projection of submittal to EPA for approval fall of 2014. *Executive summaries of the proposed standards and their bases will accompany the meeting notes.* The nitrate standard for aquatic life was separated out for the next triennial review beginning this November. An EPA contractor is completing some additional toxicity tests, with final results due early 2014. MPCA will evaluate the data, produce a revised draft technical support document and begin final rule adoption, which is likely more than a year away. More on **the proposed nitrate standard**: <http://www.pca.state.mn.us/index.php/view-document.html?gid=15398>

*Macroinvertebrate sampling methods comparison for UMR*

MPCA, WI-DNR and MCES project **to compare macroinvertebrate sampling techniques** on the UMR. Update from [Will Bouchard](#), MPCA.

As of September 2013 -

- **Hester Dendy (HD) samplers** were deployed at 28 stations on the UMR from the Twin Cities down to LD #6.
- HDs were also deployed in the Minnesota River (2 stations), on three Wisconsin tributaries (3 stations), and on the UMR above the Twin Cities (38 stations). These stations will be used to expand the disturbance gradient.
- Most HDs were retrieved after a 6-week deployment period (samplers were lost at 3 of the 28 UMR stations). In addition, at a handful of stations the velocity was below the minimum so that data may not be useable. We are still compiling information to determine the total number of good HD samples that were collected.
- During retrievals, **kick net (KN) samples** were also collected. No issues were reported with the collection of these samples.
- Water chemistry was collected during both visits to the stations.
- **The macroinvertebrate data will be available for the HDs and KNs next spring.** These data will be used to **assess whether HD, KN, or combined (HD+KN) samples are a better measure** of macroinvertebrate biological condition to support 303d assessments of aquatic life uses on the UMR. This will require an assessment of their sensitivity to stress as well as their relative effort (deployment, processing costs, recovery rates, etc.) to determine which is sufficient for monitoring biological condition on the UMR.
- **A draft report should be available in about a year.**

Additional comments from John Sullivan: Lost 2/19 HD, which is not bad. The KN were considerably more trouble and zebra mussels present a problem.

*Nitrogen in Minnesota Surface Waters*

Early last summer the MPCA released the report of a **comprehensive study of nitrogen in surface waters in Minnesota**. It supports the development of a Nutrient Reduction Strategy to address Gulf Hypoxia with a solid science foundation.

Aspects of the report are:

- Comparison of concentrations and load trends from HUC8 watersheds around the state to inform finer scale management.
- Discussion of nitrate as a component of TN with known factors in the spatial patterns seen.
- Identification of **cropland ground water and tile drainage as the highest contributing sources**.
- Addresses uncertainties and used five different analytical approaches to corroborate conclusions.
- Discusses reduction options.

The 20-page executive summary is here: <http://www.pca.state.mn.us/index.php/water/water-types-and-programs/surface-water/nutrient-reduction/report-on-nitrogen-in-surface-water.html>

The Minnesota Department of Agriculture released for public comment a draft revision of the Minnesota Nitrogen Fertilizer Management Plan. This plan is directed towards management to limit impacts to ground water.

<http://www.mda.state.mn.us/chemicals/fertilizers/nutrient-mgmt/nitrogenplan.aspx>

Minnesota state agencies and departments ability to carry out their missions relative to nitrogen sources is fairly limited by statutory mandates. Hearings at the state legislature are scheduled for fall 2013 to discuss the issue.

*Large River Monitoring in Minnesota*

More than a decade ago, the MPCA established an [intensive watershed monitoring effort](#) with a progressive design based on HUC8s using biological as well as physical-chemical measures of lake and stream health. This approach has provided a much improved set of information for Clean Water Act assessment decisions, but the design did not include a monitoring approach for **large river main stem reaches** of the Mississippi, Minnesota, Rainy, Red and St. Croix until **2013. This summer began a rotation** among the systems, starting with the Mississippi River upstream of St Anthony Falls. Parameters include TSS, TSVS, TP,TKN, NO<sub>2</sub>NO<sub>3</sub>, Sulfate, chloride, Hardness, E. coli, chlor a, and pheophytin at 11 sites 3Xmonthly June-Aug, 1X May and Sept; same list minus bacteria and same frequency at 7 sites below WWTP; 21 sites fish and Hester Dendy inverts; 6 sites for fish tissue-contaminant sampling.