

Upper Midwest Environmental Sciences Center August 2011 Activity Report

Aquatic Invasive Species – Sea Lamprey

Sea Lamprey Pheromone Testing

- Jane Rivera gave a presentation on Federal and State biopesticide requirements for sea lamprey pheromone experimental use permits and registration in the United States and Canada, at the biannual Great Lakes Fishery Commission's (GLFC) Reproduction Reduction Task Force meeting, August 31-September 1 in Ann Arbor, MI. The Reproduction Reduction Task Force coordinates the optimization of sea lamprey pheromone, sterile-male-release, and trapping strategies for the GLFC's Integrated Management of Sea Lamprey (*Petromyzon marinus*) Control program. UMESC continues to provide long-term technical assistance and research support to the GLFC.

Aquatic Invasive Species – Zebra and Quagga Mussels

ZEQUANOX®, A Potential Tool for Controlling Zebra and Quagga Mussels

- Jim Luoma, Kerry Weber, Terry Hubert and Mark Gaikowski met with scientists from the New York State Museum (NYSM) and Marrone Bio Innovations, Inc. to discuss studies with ZEQUANOX®, August 24-26 at UMESC. ZEQUANOX® contains killed cells of a specific strain of *Pseudomonas fluorescens*, originally identified by NYSM scientists Dan Molloy and Denise Mayer as a potential tool to control dreissenid mussels. Additionally, UMESC scientists met with aquatic invasive species specialists from Iowa, Minnesota, and Wisconsin to discuss potential locations for field trials of ZEQUANOX® to control dreissenid mussels on native mussel beds or restoration equipment.

Climate Change

Potential Impacts of Climate Change on Migratory Waterbirds

- Wayne Thogmartin, Patrick McKann (UMESC), Greg Forcey, William Bleier (North Dakota State University), and George Linz (U.S. Department of Agriculture, Wildlife Services) published information useful for understanding potential changes in populations of four migratory waterbird species, in future landscape and climate conditions. The team developed waterbird conservation models to serve two purposes: (1) provide information on how waterbird populations are related to climate and land-use patterns at varying spatial scales, and (2) provide maps of predicted relative abundance suggesting locations where conservation and management efforts should be focused in order to have maximum benefit on habitats favoring the species of interest. The research team noted; while the climate cannot be managed, it is possible to manage landuse patterns to aid in the conservation and management of waterbirds in large ecoregions.
 - Forcey, G. M., W. E. Thogmartin, G. M. Linz, W. J. Bleier, and P. C. McKann. 2011. [Land use and climate influences on waterbirds in the Prairie Potholes](#). Journal of Biogeography 38:1694–1707.

Environmental Contaminants

Estimating the Ability of Native Mussels to Sequester Aquatic Contaminants

- Teresa Newton (UMESC), Alissa Ganser, and Patty Ries (University of Wisconsin-La Crosse) sampled native freshwater mussels Mississippi River navigation Pool 5 during August 2011 for a collaborative project with North Carolina State University and Ecological Specialists, Inc. Recent mussel population estimates for the navigation pool are providing an unprecedented opportunity to assess the magnitude of service's mussels provide to humans and other components of the ecosystem, by sequestering aquatic contaminants. The combined use of the population estimates and measurements of tissue burdens of toxicants (e.g., heavy metals,

PCBs, PAHs) in individual mussels allow for the calculation and modeling of total mass of specific toxicants tied up in the mussel compartment, which would otherwise be available for uptake by other organisms (including humans).

Mercury and Waterbirds

- Kevin Kenow co-authored a manuscript on temporal trends in blood mercury (Hg) levels in common loon chicks in northern Wisconsin. Trend analyses indicated that Hg concentrations in the blood of Wisconsin loons declined over the period 1992–2000, and increased during 2002–2010, but not to the level observed in the early 1990s. The authors tentatively concluded that drought-induced changes in the aquatic methylmercury cycle may have rippled through the food chain to loons, and cautioned this effect may have lakespecific and/or region-specific attributes.
 - Meyer, M.W., P.W. Rasmussen, C.J. Watras, B.M. Fevold, K.P. Kenow. 2011. [Bi-phasic trends in mercury concentrations in blood of Wisconsin common loons during 1992–2010](#). *Ecotoxicology*. DOI 10.1007/s10646-011-0759-1.
- Kevin Kenow, Brian Gray (*UMESC*), Michael Meyer (*WI Department of Natural Resources*), Ronald Rossmann (*EPA*), and Annette Gendron-Fitzpatrick (*University of Wisconsin-Madison*) published the results from their study to determine the level of in ovomethylmercury exposure that results in detrimental effects on fitness and survival of loon embryos and hatched chicks. Their study showed exposure to methylmercury may prolong the incubation period of developing common loon embryos, and chick yolk sac mass at hatch was negatively related to egg mercury concentration. An egg mercury median lethal concentration was established, and results indicated a reduction in loon egg hatchability within ecologically-relevant egg mercury concentrations. This is the first study to identify a direct causal relation between loon hatch success (and chick fitness) and in ovoexposure to methylmercury.
 - Kenow, Kevin P., Michael W. Meyer, Ronald Rossmann, Annette Gendron-Fitzpatrick, Brian R. Gray. 2011. [Effects of injected methylmercury on the hatching of common loon \(*Gavia immer*\) eggs](#). *Ecotoxicology* (DOI: 10.1007/s10646-011-0743-9)

Geospatial Science & Technology

Computer Applications

- Doug Olsen has posted online a new DSS tool for software program ArcGIS, the Edge Analysis Tool (<http://www.umesc.usgs.gov/dss.html>). The Edge Analysis Tool allows users to determine the amount and type of edge bordering an Area of Interest data set, according to attributes established by a Background data set.
 - Example. A Background data set would typically be a physical or political landscape data set (e.g., *land cover, state or county boundaries, hydrologic unit codes*). The Area of Interest data set defines the study area for which edge types and lengths are calculated. If a land cover data set is used as the Background data set and the outline of a lake is the Area of Interest, the output would be an outline of the lake attributed with a user-selected field from land cover data set. The user would then be able to see which land cover types bordered the lake, and the sum of their edge lengths.

Great Lakes Restoration Initiative (GLRI)

Project #80, Birds as Indicators of Contaminant Exposure

- Christine Custer was interviewed by the Wisconsin Department of Natural Resources, August 29, for a video highlighting collaborative Great Lakes Restoration Initiative (GLRI) projects in Wisconsin. Custer is working on GLRI Project 80, Birds as Indicators of Contaminant Exposure and Effects, which includes the collection of data within a number of Wisconsin

Areas of Concern (AOCs). Data generated from this project should be immediately useful in the AOC delisting process.

- Christine Custer and Thomas Custer presented preliminary results of GLRI Project 80 to colleagues at the U.S. Environmental Protection Agency (EPA) in Chicago, IL, August 31. The Custer's are working collaboratively with the EPA at several Areas of Concern (AOCs) across the Great Lakes. The 2010 data represent the first year's effort to provide a basin-wide assessment of contaminant exposure both for legacy contaminants (e.g., PCBs, mercury, dioxins/furans), and new and emerging contaminants (e.g., polybrominated flame retardants and perfluorinated chemicals). The 2010 data will serve as a baseline to assess remedy effectiveness as well. The data will also be used to assist in the assessment of Beneficial Use Impairments as part of the delisting process for the Great Lakes AOCs.

Project #73, Avian Botulism in Distressed Great Lakes Environments

- Kevin Kenow presented the poster, "Monitoring the fall and winter distribution and foraging patterns of waterbirds on Lake Michigan," at the 2011 Midwest Bird Conservation and Monitoring Conference, August 2-3 in Zion, IL. Wayne Thogmartin also participated in the conference, and attended a meeting of the Great Lakes Joint Venture Technical Committee.
- Kevin Kenow was interviewed by Marshall Helmberger (*Timberjay Newspaper, Tower, MN*) on Kenow's work with common loons for GLRI project #73. The article highlighted the project's satellite and geo-tracking activities and how the data are being used. The article appeared in the July 29 issue of the Timberjay Newspaper ([see attached](#))

Project #82, Characterize Habitat and Foodweb Structures across Great Lakes Rivermouth Estuaries

- John (JC) Nelson, Bill Richardson, James Larson and Jon Vallazza (*UMESC*) hosted a visit from Jeff Schaeffer (*GLSC*) August 23-24, to examine geospatial data that can be used to answer questions related to in-river processes, for GLRI Project #82. While at UMESC Schaeffer delivered samples collected during his last sampling effort, for laboratory analysis.
- Larry Robinson (*UMESC*) and Brian Lubinski (*FWS*) collected and processed color infrared aerial photography for use in wetland classification, for the lower portions of the Manitowoc (WI), Ford, and Pere Marquette Rivers (MI). All three rivers flow into Lake Michigan.

Long Term Resource Monitoring Program

25th Anniversary Celebration (*upcoming event*)

- Mike Jawson and Barry Johnson will participate in a celebration for the 25th anniversary of the Upper Mississippi River Restoration's Environmental Management Program (EMP), September 28-29 in Dubuque, IA. The EMP has successfully monitored the ecological health and restored 100,000-acres of habitat on the Upper Mississippi River System (UMRS). Celebration activities will include a dinner on the 28th followed by a commemoration ceremony and field trip on the 29th. Assistant Secretary of the Army for Public Works, Jo Ellen Darcy, will attend the event. The EMP is a cooperative research and monitoring program for the Upper Mississippi River System, funded by the U.S. Army Corps of Engineers (USACE) and implemented by USGS-UMESC, in collaboration with the U.S. Fish and Wildlife Service (FWS), EPA, and the states of Illinois, Iowa, Minnesota, Missouri, and Wisconsin.

Adaptive Management Workshop

- Mike Jawson and Barry Johnson (*UMESC*) helped coordinate, facilitate, and participated in the Environmental Management Program's (EMP) [Adaptive Management Workshop](#) (AMW),

August 17-18 in Davenport, IA. The EMP is continually enhancing its restoration techniques using insights gained from existing projects and new research findings. However, the EMP does not have an explicit process for incorporating lessons learned into project design, construction, and operation and maintenance. Implementing active adaptive management is often technically difficult and costly, and thus has not been explored significantly to date. The AMW was designed to:

- Identify issues to address in an adaptive management issue paper, as an addendum to the [Upper Mississippi River Restoration Report to Congress 2010](#).
- Develop a common understanding of adaptive management terminology and concepts.
- Discuss levels of investment for implementing adaptive management, given other program needs.
- Define practical implementation constraints (or sideboards) and assumptions.
- Identify 3-4 potential frameworks for EMP's adaptive management efforts.

Evaluating Submersed Aquatic Vegetation Sampling Techniques

- Yao Yin and Rebecca Kreiling published the results from a study to evaluate the effectiveness of using rake sampling to quantify Submersed Aquatic Vegetation (SAV) in turbid environments. Their analysis showed rake sampling retrieved 70% of the species present, whereas visual inspection only identified 27%. The LTRMP uses a modified rake method to quantify frequency of occurrence and abundance of SAV in the UMRS. The authors found that frequency of occurrence was a good index of abundance for all species. For species with relatively high biomass (*greater than 30 g/m²*), the additive density rating (*the sum of the density ratings from six subsamples*) was a good index of species diversity and abundance.
 - Yin, Y., R.M. Kreiling. 2011. [The evaluation of a rake method to quantify submersed vegetation in the Upper Mississippi River](#). *Hydrobiologia*. 675:187-195.

Quarterly Coordination Meetings

- Mike Jawson and Barry Johnson participated in the quarterly meetings of the Upper Mississippi River Basin Association ([UMRBA](#)), August 16-17 in Davenport, IA. The UMRBA is a regional interstate organization formed by the Governors of Illinois, Iowa, Minnesota, Missouri, and Wisconsin to coordinate the states' river-related programs and policies and work with federal agencies that have river responsibilities. Jawson and Johnson participated in the UMRBA committee meeting ([PDF](#)) and the Environmental Management Program Coordinating Committee (EMP-CC) meeting ([PDF](#)).

Resource Mapping

- Larry Robinson (*UMESC*) and Brian Lubinski (*FWS*) continued collection of late-summer 16-inch per pixel aerial photography for the UMRS from navigation dam 13 (located near *Clinton, IA*) to the confluence of the Ohio River and the Illinois River. This effort is a continuation of the systemic imagery acquisition for the UMRS that started last summer but was halted due to high water. The photos are being used to develop a systemic vegetation inventory. Similar systemic inventories were conducted in 1989 and 2000.
- Janis Ruhser and Larry Robinson began processing the 2011 UMRS aerial photography for Mississippi River navigation Pools 14-19 (*Clinton to Keokuk, IA*) and Illinois River navigation pools Dresden, Brandon, and Lockport (*Divine, IL to Lake Michigan*).
- Jenny Hanson and Erin Hoy conducted field reconnaissance of 2011 UMRS aerial photography for Mississippi River navigation Pools 18, 19, 26 and the Open River (*south of navigation dam 26*) August 14-24. Hanson and Hoy compared ground vegetation to aerial photography, and collected data points to develop mapping models. They were assisted by

staff from the Open Rivers and Wetlands Field Station in Jackson, MO and the National Great Rivers Research and Education Center in East Alton, IL.

National Fish Habitat Action Plan

Fishers and Farmers Partnership

- Ken Lubinski co-lead a discussion on stream restoration project monitoring at a Fishers and Farmers Partnership workshop in Webster City, IA, Aug. 17-18. Presentations included speakers from the Iowa Soybean Association, Iowa Department of Natural Resources, Iowa State University, and The Nature Conservancy. Attendees toured an ox-bow restoration site on the Boone River, designed to create habitat for the Topeka shiner. The workshop is one of three intended to gather ideas for the development of a monitoring strategy for Fishers and Farmers, an operational unit of the National Fish Habitat Action Plan

National Park Mapping

Appalachian National Scenic Trail (APPA)

- Janis Ruhser completed stereo models and flightline mosaics for the entire Central Appalachians Ecoregion of the Appalachian National Scenic Trail (APPA). These stereo models and mosaics will be used to complete the vegetation mapping of APPA for the National Park Service Vegetation Inventory Program.
- Kevin Hop, Andrew Strassman (*UMESC*), and Tony Davis (*PA Natural Heritage*) conducted the second of three field reconnaissance trips to the Central Appalachian Ecoregion of the APPA August 14-27. The field effort supports the development of the map classification and conventions for the mapping of the Central Appalachian Ecoregion, which will be mapped this fall and winter (2011/2012).

National Wildlife Refuges

FWS Reed Canary Grass Adaptive Management Study

- Erin Hoy (*USGS*) and Eric Nelson (*FWS retired*) traveled to Swan Lake and Squaw Creek National Wildlife Refuges August 30-September 1, to assist refuge staff with summer sampling for the FWS Reed Canary Grass Adaptive Management (RCGAM) study. On August 8, Hoy and Ben Walker (*La Crosse District FWS*) collected samples in the Upper Mississippi River National Wildlife and Fish Refuge, and August 10-12 Hoy assisted with sampling in the Minnesota Valley National Wildlife Refuge. This is the final year of extensive vegetation data collection for the RCGAM study.

Other

International Projects

- William Richardson is traveling to Brittany, France by way of Salzburg, Austria (*August 30-September 23*) to co-teach the course, "Life in Oceans, Lakes, and Rivers" with Ulrike Berniger and Stephan Wickham (*University of Salzburg, Austria*). The 2-week course will rigorously describe the characteristics and importance of natural aquatic and marine ecosystems – helping to instill an appreciation of environmental health and its importance to the well-being of human culture. The course is sponsored by the German "Studienstiftung des deutschen Volkes Auslaudsteam" (*German National Merit Foundation, supported by the German government*), one of many Summer Academies located throughout Europe designed to further educate elite German University students through interaction with national and international scholars on a wide range of courses. During this time, Richardson, Wickham, and Beringer will also prepare the project proposal, "Disturbance, Productivity and Ciliate Diversity in Floodplains: Testing Huston's Dynamic Equilibrium Hypothesis with Floodplain Ciliate Communities" for submission to the Austrian National Science Foundation. If funded, the project will evaluate the effect of

hydrodynamic disturbance on ciliate communities in the Danube, Upper Mississippi, and St. Croix Rivers.

Great Lakes Fishery Commission

- UMESC hosted a meeting with Charles Krueger (*GLFC Science Director*), Monday August 15, to review the collaborative work efforts between UMESC and the Great Lakes Fishery Commission, status of ongoing projects, potential new projects, and the budgets for FY 2012 and beyond.

USGS Science Data Coordination Team

- John (JC) Nelson has been asked to co-represent the USGS-Midwest Area on the new science data coordination team. The team was formed to help address data requirements of the USGS's 10-year plan, as well as help support core science systems. The kickoff meeting will be August 15 in Denver, CO.

Acronyms

AMW – Adaptive Management Workshop

AOC – Area of Concern

APPA - Appalachian National Scenic Trail

DSS – Decision Support System

EMP – Environmental Management Program

EMP-CC – Environmental Management Program Coordinating Committee

EPA – U.S. Environmental Protection Agency

FWS – U.S. Fish and Wildlife Service

GLFC – Great Lakes Fishery Commission

GLRI – Great Lakes Restoration Initiative

GLSC – Great Lakes Science Center

Hg – Mercury

LTRMP – Long Term Resource Monitoring Program

NYSM – New York State Museum

PAHs – Polycyclic Aromatic Hydrocarbons

PCBs – Polychlorinated Biphenyls

RCGAM – Reed Canary Grass Adaptive Management

SAV – Submersed Aquatic Vegetation

UMESC – Upper Midwest Environmental Sciences Center

UMRBA – Upper Mississippi River Basin Association

UMRS – Upper Mississippi River System (Minneapolis, MN to Cairo, IL and the Illinois River)

USACE – U.S. Army Corps of Engineers

USGS – U.S. Geological Survey