

**Minutes of the 140th Quarterly Meeting
of the
Upper Mississippi River Basin Association**

**November 15, 2016
St. Paul, Minnesota**

UMRBA Chair Robert Stout called the meeting to order at 9:32 a.m. Participants were as follows:

UMRBA Representatives, Alternates, and State Members of the Water Quality Executive Committee:

Rick Gosch	Illinois Department of Natural Resources
Dan Stephenson	Illinois Department of Natural Resources
Tim Hall	Iowa Department of Natural Resources
Adam Schnieders	Iowa Department of Natural Resources
Dave Frederickson	Minnesota Department of Agriculture
Rebecca Flood	Minnesota Pollution Control Agency
Barb Naramore	Minnesota Department of Natural Resources
Patrick Phenow	Minnesota Department of Transportation
Robert Stout	Missouri Department of Natural Resources
John Madras	Missouri Department of Natural Resources
Bryan Hopkins	Missouri Department of Natural Resources
Dan Baumann	Wisconsin Department of Natural Resources
Jim Fischer	Wisconsin Department of Natural Resources
John Petty	Wisconsin Department of Agriculture, Trade, and Consumer Protection
Brian Weigel	Wisconsin Department of Natural Resources

Federal UMRBA Liaisons:

Ryan Galbreath	U.S. Department of Agriculture, NRCS
Donald Balch	U.S. Army Corps of Engineers, MVD
Kathy Kowal	U.S. Environmental Protection Agency (by phone)
Charlie Wooley	U.S. Fish and Wildlife Service
Scott Morlock	U.S. Geological Survey

Others in Attendance:

Megan Moore	Minnesota Department of Natural Resources
Kevin Stauffer	Minnesota Department of Natural Resources
Randall Schultz	Iowa Department of Natural Resources
Steve Clark	U.S. Army Corps of Engineers, MVP
Jon Hendrickson	U.S. Army Corps of Engineers, MVP
Sharin Khazrajafari	U.S. Army Corps of Engineers, MVP
Aaron McFarlane	U.S. Army Corps of Engineers, MVP
Tom Novak	U.S. Army Corps of Engineers, MVP
Steve Tapp	U.S. Army Corps of Engineers, MVP
Ken Barr	U.S. Army Corps of Engineers, MVR
Marv Hubbell	U.S. Army Corps of Engineers, MVR
Karen Hagerty	U.S. Army Corps of Engineers, MVR
Jason Smith	U.S. Army Corps of Engineers, MVR

Scott Whitney	U.S. Army Corps of Engineers, MVR
David Busse	U.S. Army Corps of Engineers, MVS
Hal Graef	U.S. Army Corps of Engineers, MVS (by phone)
Brian Johnson	U.S. Army Corps of Engineers, MVS
Brian Markert	U.S. Army Corps of Engineers, MVS
Monique Savage	U.S. Army Corps of Engineers, MVS
Joan Stemler	U.S. Army Corps of Engineers, MVS (by phone)
Sabrina Chandler	U.S. Fish and Wildlife Service
Justin Sexton	U.S. Fish and Wildlife Service
Mark Gaikowski	U.S. Geological Survey, UMESC
Jeff Ziegeweid	U.S. Geological Survey
Craig Schmidt	National Weather Service
Glenn Rohloff	Metropolitan Water Reclamation District of Greater Chicago (by phone)
Tim Schlagenhaft	Audubon
Paul Dierking	HDR
Brad Walker	Missouri Coalition for the Environment
Gretchen Benjamin	The Nature Conservancy
Mike Klingner	Upper Mississippi, Illinois, and Missouri Rivers Association
Dru Buntin	Upper Mississippi River Basin Association
Dave Hokanson	Upper Mississippi River Basin Association
Matt Jacobson	Upper Mississippi River Basin Association
Tyler Leske	Upper Mississippi River Basin Association
Kirsten Mickelsen	Upper Mississippi River Basin Association
Mike Robinson	Upper Mississippi River Basin Association

Minutes

Dan Baumann moved and Tim Hall seconded a motion to approve the draft minutes of the August 9, 2016 quarterly meeting as written. The motion carried unanimously on a voice vote.

Executive Director's Report

Dru Buntin presented the Executive Director's report and noted that the report is organized according to the focus areas in the 2013-17 UMRBA Strategic Plan. Among the items in the report, in the *Commercial Navigation focus area*, Buntin said he attended the October 5, 2016 meeting of the Inland Waterway Users Board (IWUB) in Tinley Park, Illinois. The meeting also included an October 4, 2016 tour of the aquatic invasive species electric barriers at Romeoville, Illinois, the Lockport Lock and Dam, and the Brandon Road Lock and Dam. At the IWUB meeting, Buntin said members discussed concerns regarding potential impacts to inland navigation from some proposed aquatic invasive species control measures – in particular those being considered under the Great Lakes and Mississippi River Interbasin Study (GLMRIS) Brandon Road Study. The IWUB also heard an update from the Corps regarding FY 2017 funding for inland navigation activities and the status of Inland Waterways Trust Fund revenues. Corps staff also provided a presentation regarding the basic economic analysis performed by the Corps for construction projects.

Buntin said UMRBA staff are working with the five UMRS state departments of transportation to develop an interactive web-based inventory of the UMRS's commercial navigation-related assets. This would include information about ports and terminals, foreign trade zones, and intermodal connections, among other things. Buntin said the M-35 Advisory Committee recommended this effort at its February 22, 2016 meeting. In addition, staff held an October 24, 2016 call with staff from the Great Lakes Commission to share insights and discuss potential opportunities to collaborate in the future. Buntin said the Commission is developing a somewhat similar asset inventory for the Great Lakes and St. Lawrence Seaway.

In the *Ecosystem Restoration and Monitoring focus area*, Buntin said UMRBA staff continue to work with Corps staff to develop the draft 2016 UMRR Report to Congress, including incorporating professional graphics and gathering partner support letters. A final copy of the draft report was supplied to the office of ASA (CW) Jo-Ellen Darcy on November 1, 2016 for review. Buntin said the anticipated schedule is to finalize the report in early to mid-December. He said UMRBA supplied an October 25, 2016 letter of support for inclusion in the report and noted that the letter is included in pages B-8 to B-9 of the meeting packet.

Buntin said he and Kirsten Mickelsen participated in a September 27-29, 2016 UMRR HREP team meeting in Davenport, Iowa that covered a range of topics related to the program's habitat projects. Discussion included agency perspectives on UMRR's restoration, floodplain forest restoration, water level management, and long term monitoring and research findings. In addition, the meeting included a facilitated discussion regarding monitoring of biological responses to habitat restoration techniques and approaches. Meeting objectives included building relationships and facilitating dialogue, discussing insights gained from constructing previous projects and long term monitoring, and strengthening UMRR's restoration efforts. Buntin said UMRBA staff provided meeting-related support per the 2016 support services agreement with the Corps.

In the *Flood Risk Management focus area*, Buntin said he, UMRBA Board members Rick Gosch and Robert Stout, Loren Wobig from the Illinois Department of Natural Resources, and Dale Smultzler from the Missouri State Emergency Management Agency attended an August 22, 2016 levee stakeholders' summit hosted by the Upper Mississippi, Illinois, and Missouri Rivers Association (UMIMRA) in Hannibal, Missouri. Buntin said Mississippi Valley Division Commander Michael Wehr also attended the summit and former Rock Island Division Commander Robert Sinkler (now representing the Nature Conservancy) moderated the meeting, which was focused on gathering input from stakeholders regarding implementation of the Upper Mississippi River Comprehensive Plan. Buntin said he provided remarks outlining the states' support for a watershed study addressing flood risk and channel maintenance.

In the *Spill Response Planning and Mapping focus area*, Dave Hokanson introduced UMRBA Oil Pollution Act (OPA) project staff Matt Jacobson, Tyler Leske, and Mike Robinson. Hokanson said OPA staff's current focus is the Illinois statewide update of the Inland Sensitivity Atlas. This has included significant data updating and development for a number of Atlas themes including hazardous materials, managed lands, aboveground storage tanks, pipelines, dams, marinas, and surface water intakes. Hokanson said project staff also continue to facilitate the development of spill response plans for UMR pools via an interagency process. The current area of focus for this work is UMR Pools 11 and 12.

Hokanson said UMRBA staff have continued their work under a cooperative agreement with the National Park Service (NPS) to create spill response planning tools for the St. Croix National Scenic Riverway. To date, project staff have completed a preliminary hazard analysis for the Riverway and created a web-based map interface to support spill plan development.

Hokanson said the UMR Spills Group met October 25-26, 2016 in Moline, Illinois. Topics addressed at this meeting included case studies of recent UMR spill events, development of web-based tools to support the Group's work, geographically-specific planning efforts and upcoming training/exercises. Hokanson said the UMR Spills Group will next meet in early spring 2017.

In the *Cross Cutting Collaboration focus area*, Buntin indicated UMRBA staff have been working with USFWS Division of Economics, the Nature Conservancy (TNC), the Mississippi River Cities and Towns Initiative (MRCTI), and state agency partners to develop the UMRS Economic Profile. Results of the first iteration were published in spring 2016 and included a one county boundary on the Mississippi River from the Twin Cities to the confluence to the Ohio River. Buntin said this first iteration estimated that the river generates \$253 billion annually and supports 755,000 jobs. He said

results of a second iteration released in August 2016 extends the geographic coverage of the report to the headwaters, expands to two counties along the length of the mainstem from the confluence with the Ohio River to the Twin Cities, and one county deep from the Twin Cities to Lake Itasca. Buntin said this second iteration estimates that the river generates more than \$345 billion annually and supports more than one million jobs.

Buntin said the USFWS Division of Economics plans to complete the Illinois River profile early in 2017 for incorporation into the full UMRS profile report. In addition, Dr. Kris Johnson with TNC is authoring a chapter on the economic benefits of the many ecological services derived from the river.

Dave Hokanson said he participated in a meeting of the America's Watershed Initiative (AWI) steering committee held in Moline, Illinois on October 12, 2016. Topics addressed in this meeting included mechanisms to recognize projects and innovation that will help "raise the grade" in the AWI report card's goal areas, as well as the process of creating the next report card for the Mississippi River Basin, which is targeted for completion in 2020.

Hokanson said UMRBA staff participated in the planning committee and attended the Upper Mississippi River Conference (UMR Conference) held in Moline, Illinois on October 13-14, 2016. The UMR Conference was designed to identify steps to "raise the grade" found in the various goal areas of the America's Watershed Initiative (AWI) report card for the Mississippi River Basin, which was released in 2015. Hokanson said Association staff will remain engaged in post-conference activities, including review and compilation of recommendations from conference attendees and development of follow up action plan(s) as appropriate.

Buntin said UMRBA Board member Bryan Hopkins and staff Kirsten Mickelsen presented on the results of the first and second iterations of the UMR Economic Profile to the Mississippi River Cities and Towns Initiative (MRCTI) at its September 13-15, 2016 annual meeting in Natchez, Mississippi. Buntin said MRCTI agreed to work collaboratively with UMRBA and other partners to communicate the value of the Mississippi River to the next Administration. He said the MRCTI meeting also included presentations related to sustainable agricultural practices, flood risk reduction and climate change predictions, commercial navigation, and National Geographic's new geo-tourism website for the Mississippi River.

Buntin said he participated in the October 11-13, 2016 Annual Meeting of the Interstate Council on Water Policy (ICWP) in St. Paul, Minnesota. For the past year, Buntin said he has served as Chair of ICWP. The meeting included a field tour of White Bear Lake to highlight management challenges with surface and groundwater interactions at the site. Attendees also visited Hugo, Minnesota to review some of the innovative stormwater management and reuse projects being implemented there. The tour also included a stop at St. Anthony Falls. Buntin said the ICWP Annual Meeting included updates from a number of federal agencies regarding key priorities and emerging water resource management tools and activities. He said Heidi Moltz with the Interstate Commission on the Potomac River Basin was elected as the next ICWP Chair.

Buntin said UMRBA Board members and staff met in St. Louis, Missouri on October 17-18, 2016 to begin the process of formulating the Association's 2018-2022 Strategic Plan. The current five-year UMRBA Strategic Plan was adopted in 2013 and runs through 2017. At the St. Louis meeting, Buntin said Board members discussed the overall structure of the strategic plan focus areas and agreed that the current structure does not require major changes. The Board also discussed the *Flood Risk Management focus area* in greater detail and directed staff to prepare recommendations for stakeholder surveys similar to those used in the last planning process.

Buntin said the Board and Water Quality Executive Committee also met the preceding day (November 14) to discuss the *Water Quality focus area* and the *Spill Response Planning and Mapping focus area* in detail. Buntin explained that the Board will discuss the remaining focus areas in conjunction with the February and May 2017 quarterly meetings. He said the Board also directed Association staff to develop surveys similar to those used in 2013 to obtain input from partners.

Buntin directed the Board's attention to page B-25 of the agenda packet for a copy of UMRBA Treasurer Jason Tidemann's statement regarding his review of UMRBA's financial statement for the period of July 1, 2016 through September 30, 2016. Dan Stephenson offered and Tim Hall seconded a motion to approve the Treasurer's statement. The Board unanimously adopted the motion by voice vote.

Water Quality Executive Committee Report

Committee Chair Brian Weigel provided a report on behalf of the Water Quality Executive Committee (WQEC). Weigel shared with the Board an excerpt of the UMR Governors' statement from 2007 highlighting the states commitment to coordinated implementation of the Clean Water Act in the Upper Mississippi River that still guides UMRBA's work today. He shared some of the Association's water quality program highlights from 2016. Weigel said initiating the Minnesota-Wisconsin pilot implementation of the *UMR Recommended Monitoring Plan* in the Twin Cities to La Crosse, Wisconsin reaches was a significant accomplishment. He said the monitoring includes chemical, physical, and biological parameters and is being accomplished through the work of the Minnesota Department of Natural Resources, Minnesota Pollution Control Agency, the (Twin Cities) Metropolitan Council, and the Wisconsin Department of Natural Resources. Weigel said UMRBA staff developed a web-based water quality viewer to assist with pilot implementation and also drafted a field operations manual for the project. He said monitoring began in May 2016 and is expected to conclude in April 2017. In response to a question from Adam Schnieders, Weigel said each state would follow their respective administrative codes in terms of actions arising from data collected during the pilot monitoring. Rebecca Flood noted that Minnesota has worked collaboratively with Wisconsin on the St. Croix and Lake Pepin TMDLs. Dave Hokanson noted that the WQEC and WQTF have developed a provisional assessment methodology for the UMR. Flood noted that this project will help the states develop a better understanding of each other's respective monitoring and assessment processes.

Weigel said the Association also established the UMR Harmful Algal Bloom (HAB) Work Group in 2016 and developed a UMR HAB Response Resource Manual. Weigel said the states have also used the WQEC and the Water Quality Task Force (WQTF) as venues to exchange information related to implementation of state nutrient reduction strategies and TMDLs and to consult on impairment listings. Weigel said UMRBA also developed and executed a memorandum of common purpose related to water quality with the Mississippi River Cities and Towns Initiative (MRCTI).

Weigel said 2017 UMRBA water quality priorities include completion and evaluation of the pilot monitoring plan, and testing of the provisional assessment methodology using pilot data. He said UMRBA will continue to support the UMR HABs Work Group and refine the Resource Manual as needed. UMRBA will also continue to facilitate information exchange on best practices and case studies related to nutrient reduction strategy implementation. Weigel said UMRBA staff will also continue to develop web-based tools to support water quality work.

Chicago Nutrient Reduction Facility

Glenn Rohloff provided an overview of the Metropolitan Water Reclamation District of Greater Chicago's (MWRD) phosphorus recovery project. Rohloff said MWRD informed the Illinois EPA in a November 2011 letter of their intent to biologically remove phosphorus using existing infrastructure, to

recover phosphorus where possible, and to work within their long term strategic plan on resource recovery and sustainability. In 2012, MWRD formed a district-wide Phosphorus Task Force to lead a study and implementation of enhance biological phosphorus removal (EBPR). In May 2012, Rohloff said MWRD conducted full-scale tests in one battery at the Stickney Water Reclamation Plant (WRP). By fall of 2013, he said the Stickney WRP had been fully configured for EBPR. In fall of 2013, Rohloff said MWRD awarded a contract for constructing a phosphorus recovery facility at Stickney using technology developed by Ostara Nutrient Recover Technologies, Inc. Rohloff shared with the Board a diagram of how this technology will alter the lifecycle of phosphorus by recovering the resource and serving as a revenue source.

The Stickney WRP serves 2.38 million people and has a design capacity of 1,200 millions of gallons per day (MGD), with flows averaging 676 MGD in 2013. Rohloff said Stickney has four aeration batteries with eight tanks per battery, four passes per tank, and 96 circular secondary clarifiers. While the existing total phosphorus effluent limit is 1-2 mg per liter, MWRD adopted a voluntary total phosphorus effluent limit of 1.0 mg per liter by optimizing biological phosphorus removal and minimizing phosphorus return loads by 24 percent.

Rohloff showed the Board a visual depiction of the aeration battery conversion for EBPR at the Stickney WRP. He said the recovery process uses centrate and phosphorus-rich streams in the wastewater treatment plant as feed. The streams are pumped upward through the bottom of the reactor. Supersaturation conditions are used as the driving force. Sodium hydroxide is injected to raise the pH to 7.7, magnesium chloride is injected at a molar ratio of 1.1:1, and spontaneous crystal nucleation occurs. Deposition on the surface of the crystals occurs as the chemical driving force reduces and the crystals grow through this precipitation. The resulting pellets are recycled. Rohloff said the recovered product is high purity struvite (99.5 percent) composed of phosphorus, nitrogen, and magnesium that can be used as a slow release, enhance efficiency fertilizer that reduces risk of nutrient runoff. Rohloff shared model outputs used to compare various technology configurations.

Rohloff said construction on the phosphorus recovery facility at the Stickney WRP was completed in September 2016. The recovery facility was sized to accept both post-digestion centrate and pre-digestion. Based on the loading to the facility, Rohloff said with the use of the post-digestion centrifuge alone approximately 2,200 tons per year of fertilizer would be recovered. If the post digestion centrifuge and additional Ostara Waste-Activated Sludge Stripping to Remove Internal Phosphorus (WASSTRIP) technology is used, he said they estimate recovery of 7,700 tons per year of fertilizer. MWRD is converting existing abandoned tanks for WASSTRIP. Rohloff shared with the Board a series of photographs of the construction and configuration of the recovery facility as well as pictures of the recovered product.

In response to a question from Adam Schnieders, Rohloff said MWRD received three responding bids, but only evaluated two. He said Ostara was selected because the company had the greatest number of completed facilities and markets for the end product. In response to a question from Dan Baumann, Rohloff said the Stickney WRP is a combined plant and large storms impact treatment. He said the hope is to reduce phosphorus loading by maintaining an average effluent limit under 1mg per liter. In response to a question from Rebecca Flood, Rohloff said nitrification is not impacted by the phosphorus recovery technology. He said the phosphorus recover technology is compatible with denitrification technology if it were to be required.

Minnesota Water Quality Initiative Panel

Rebecca Flood, Barb Naramore, and Dave Frederickson provided an update regarding the State of Minnesota's current water quality initiatives. Given Minnesota's location at the headwaters of three major watersheds, Flood said Minnesota Governor Mark Dayton has made water quality one of the

priorities of his Administration. Flood said voter adoption of the Clean Water and Legacy constitutional amendment in 2008 has provided funding to support this water quality work. This has included the establishment of a monitoring and assessment framework as well as a “one watershed, one plan” approach. As a part of the watershed approach, Minnesota selected five pilot watersheds that included a statewide framework, but allowed for local creation of watershed plans. These local plans can then be supported with the 60 percent of state funding targeted for on-the-ground implementation. Through the watershed approach, Flood said the state is focusing on the highest priority watersheds in terms of nitrogen and phosphorus pollution. In addition, in 2015 the Minnesota legislature passed legislation requiring buffers to protect water quality along certain Minnesota waterways.

Flood said that approximately one year ago, Governor Dayton held a water summit aimed at raising awareness of water management challenges and getting input from the public on water priorities. She said aging water supply infrastructure was the highest citizen priority, and there was a general lack of awareness of clean water infrastructure needs. Flood said over 95 percent of the projected wastewater infrastructure needs in the state are driven by aging infrastructure in need of replacement and/or repair with the remaining 5 percent attributable to new water quality standards. In 2016, Flood said Governor Dayton proposed a bonding package to support water infrastructure, but the legislation did not pass. Governor Dayton plans to convene a second Minnesota Water Summit in February 2017. Flood noted that monitoring and analysis conducted to support Minnesota’s nitrogen loading reduction strategy have demonstrated that 70 percent of nitrogen loading is coming from agricultural lands. She said state agencies are working with agricultural interests to advance programs to address this. In response to a question from Robert Stout, Flood said the Governor’s proposed bonding legislation would have provided approximately \$170 million in additional funding for water infrastructure beyond the current funding provided through the state revolving loan fund (SRF). She said the proposed funding would have been primarily in the form of grants.

Barb Naramore said the Minnesota Department of Natural Resources’ (DNR) primary focus is on water quantity and land stewardship on DNR lands. She said there has been a 75 billion gallon increase in groundwater use in Minnesota over the past 25 years. Naramore said DNR is interested in water quality as it relates to future water supply. As such, they are monitoring the conversion of forest lands to crop production in Minnesota and DNR is working with the Minnesota Pollution Control Agency (PCA), Department of Agriculture, and the Department of Health to better understand the implications.

Naramore said that DNR issued maps in July 2016 of the waterways subject to the requirements of recently enacted buffer legislation. She said the agency is currently in the process of reviewing comments received on the buffer maps. The waters covered by the buffer law are based on a 1970s and 1980s-era Public Waters Inventory. Naramore said DNR cannot unilaterally change the Public Waters Inventory, but she said the agency is receiving requests for changes from some landowners. Naramore noted that DNR’s water planning work is increasingly focusing on reuse and water conservation.

Dave Frederickson said the Minnesota Department of Agriculture is working with DNR and PCA on the implications of the mapping of waters subject to the buffer law. He said he views his role as taking the regulatory mandates and making them compelling to farmers and he said his agency appreciates the working relationship they have with DNR and PCA staff on resource management issues and the buffer law implementation in particular. Frederickson said the Department of Agriculture’s responsibilities include implementation of an agricultural water quality certification program, a nitrogen fertilizer management plan, and a cover crop initiative.

In the agricultural water quality certification program, Frederickson said the department sought to improve water quality while providing regulatory certainty for producers. Producers enrolled in the program agree to implement recommended best management practices in exchange for certainty of no new regulatory requirements for at least 10 years. He said the department was able to execute a

memorandum of understanding with the Administrator of the U.S. Environmental Protection Agency and the Secretary of the U.S. Department of Agriculture regarding the program and they were able to secure legislation and funding for implementation. There are now 255 farms with over 150,000 acres enrolled in the program with 450 new best management practices implemented. He said the program entails a set of criteria on which an operation is evaluated. If evaluation results in a score of 8.5 (on a scale of 10) or higher, the operation can be certified. If the evaluation results in a score lower than 8.5, the department will provide technical assistance to achieve the required threshold.

Frederickson said the department recently established a goal of testing 70,000 rural wells for nitrate. Data from the 14,000 wells tested so far show that 10 percent have nitrate in excess of 10 parts per million, with some as high as 50 parts per million. Frederickson said that, while 90 percent of the tested wells were okay, the results on the 10 percent are compelling and he said the department is developing options to address the situation for the legislature to consider.

Frederickson said the department is supporting research and initiatives designed to expand implementation of cover crops in Minnesota. As an example, Frederickson said if a field of soybeans can be inter-seeded with a winter cover crop, a farmer can realize another \$20 to \$30 per acre in income while also benefiting water quality. He said that, while there has been much discussion regarding cover crops in Minnesota, more implementation needs to be done.

Frederickson noted that most of the programs he described are voluntary. He said current production of 200 to 300 bushels per acre makes addressing water quality even more challenging. Frederickson said there is a need to improve communication on water quality issues with people in rural areas. He said resource professionals need to make the case that they seek to work with rural citizens to address water quality issues of concern to all.

In response to a question from Robert Stout, Naramore said the buffer law applies to the entire state, not just rural areas. Given that the law is not yet implemented, she said all of the impacts are not known. The first deadline for implementation is in the fall of 2017. Naramore said landowners are starting the discussion regarding any measures they will need to take to comply with the requirements of the new law. Rebecca Flood said many municipalities have already taken measures under their respective stormwater permits. In response to an additional question from Stout, Dave Frederickson said some landowners have raised concerns that the buffer law constitutes a taking of their property. However, he said landowners have largely accepted the law as necessary. Barb Naramore noted that waters included in the Public Waters Inventory had an existing 50-foot buffer requirement prior to the new buffer law's enactment. However, it was up to the counties to enforce. Naramore said some counties fulfilled these enforcement responsibilities, while others did not.

In response to a question from Marv Hubbell, Naramore said the Public Waters Inventory is unrelated to the Waters of the United States (WOTUS) rule. While the WOTUS rule relates to wetlands, the Public Waters Inventory is related to the availability of water in Minnesota. Hubbell asked if there had been any legal challenges to the buffer law and Naramore said there had not. However, she said a legal challenge would not be a surprise. Dave Frederickson said Governor Dayton is open to looking at incentives for landowners to come into compliance with the buffer law. In response to a question from Adam Schnieders, Frederickson said nitrogen fertilizer management plans could require mandatory actions such as no winter application, but much of what will be included would be tailored to the specific case. Rebecca Flood said elevated well testing results would be what would prompt any mandatory actions.

State of the River Report 2016

Lark Weller and Trevor Russell provided an overview of the 2016 State of the River Report for the Twin Cities metro reach of the Mississippi River. Russell said representatives of the National Park Service and the Friends of the Mississippi as well as others working on the river are often asked “How is the Mississippi River?” He said it is difficult to know how to answer this question given that the Mississippi River is a large, dynamic living ecosystem – one that changes season to season and year to year. Russell said specific questions often deal with whether or not it is safe to swim in the river and eat fish caught in the river and people want to know whether pollution in the river is getting better or worse. He said the goals of the State of the River Report are to communicate information on the state of the river to a broad audience in an easily accessible way, to increase public awareness about the range of factors affecting water quality and river health, and to build public support around priorities for action to protect the river and its watershed. Russell said the resulting report is designed to be readable and accessible to the general public. Before providing the overview of the report, Russell said they wanted to thank the organizations that sponsored the report, including:

- The McKnight Foundation
- The Patrick and Aimee Butler Family Foundation
- The Mortenson Family Foundation
- The Capitol Region Watershed District
- The Minnehaha Creek Watershed District
- The Mississippi Park Connection

Russell also showed the Board a slide with a listing of the State of the River Report’s science and technical advisors from state, local and federal agencies as well as academia. He said the report is built on the work of this distinguished group of professionals who might not always have the opportunity to work together.

Russell said the Twin Cities metro reach of the Mississippi River is home to the confluence of three of Minnesota’s great rivers: the Upper Mississippi, the Minnesota, and the St. Croix. From its headwaters at Lake Itasca, the Upper Mississippi River drains about 13 million acres of diverse landscapes that include mixed forests, prairie, agriculture, and urban land areas. The Minnesota River begins at Big Stone Lake on the Minnesota-South Dakota border, and drains about 10 million acres of largely agricultural lands before its confluence with the Mississippi River in St. Paul near Fort Snelling. The St. Croix River drains about 5 million acres in Minnesota and Wisconsin before joining the Mississippi River near Prescott, Wisconsin. Further downstream, the Mississippi flows through Lake Pepin, a natural lake on the river about 60 miles south of the Twin Cities. Here, Russell said the river naturally widens and slows as it moves through the lake, allowing sediment and other pollutants to settle out on the bottom of the lake. Russell said several indicators in the report, including sediment and triclosan, reference overall pollution trends in Lake Pepin, where research provides excellent insights into the history and trends of water quality in the river.

Weller noted that for 72 miles (from the Crow River confluence in Dayton and Ramsey, to just past the St. Croix River confluence near Hastings and Prescott) the river is so unique that Congress designated it a national park in 1988: the Mississippi National River and Recreation Area. While the National Park Service owns very little land within the park, Weller said they work with many partners to protect the globally significant resources within this stretch of the river. She said the State of the River Report is one fundamental way the Park Service fulfills its role in protecting water quality.

Russell said that for this edition of the report, they selected 14 key indicators of water quality and river health, and broken them out into categories that help answer questions about swimming and recreation,

water quality, river life, and more. He said today they would be going into detail about some of these and providing a summary of the others.

Russell said the Mississippi River is a living ecosystem, and like many living things, it has a pulse. The natural fluctuations in river flows are the pulse of the watershed. Russell said that just like your pulse is symptomatic of what's going on in your body, the pulse of the river tells us about what's going on in the watershed. Russell said flows may go up and down and that this is not necessarily bad. However, he noted that we are beginning to see that the things that are causing changes in flow are also changing delivery of pollution to the river. Russell said the more we understand about flow, the better we can manage water quality in the Mississippi. He noted that metro river flows have increased by 24 percent over the last 70 years.

Russell showed the Board a graphical depiction of how water interacts with the land under natural and human influenced conditions. He said that under natural conditions, the vast majority of the rain that falls (75% or more) returns to the atmosphere either through evaporation or by being soaked up by plants, which transpire that water back into the air. The evapotranspiration process dominates the water cycle. Runoff, which makes its way into the river, is really just what is left after evaporation occurs. In cities and towns, Russell said hard surfaces such as roads, rooftops and driveways quickly flush water off the land, reducing evaporation and increasing runoff. In agricultural areas, Russell said artificially drained fields, and the lack of year-round vegetation also result in reduced evaporation, increased runoff, and higher river flows. In both cases, the reduction in evapotranspiration is small. But, Russell said these seemingly small changes, when spread over a very large landscape, have significant impacts on river flow and hydrology.

Russell said that one reason flows are increasing is that we receive more rain now than in the past. However, he said changes in precipitation alone cannot explain the changes in river flows. Russell said further analysis shows that the landscape responds differently to rain now than in the past. As an example, he showed the Board a graphical comparison of river flows per inch of rain in the St. Croix River and Minnesota River over the same time period. Both watersheds have experienced an increase in precipitation, but differ in terms of how their flows respond to that precipitation. The St. Croix River line is flat, indicating that the river has about the same amount of flow per inch of rain today as it historically has. Russell said the Minnesota River is different in that the river delivers more flow per inch of rain now than it historically did. Russell said this has implications for stream bank erosion and levels of pollutants like sediment, nitrate and phosphorus. He said this change is influenced largely by changes in land use and artificial drainage.

Russell said that many watershed lakes, wetlands, and other water features have been drained through an extensive network of drain tiles and drainage ditches. Water that would have ponded on the surface and evaporated is instead routed through these drainage systems and into waterways. As a result, less water evaporates back into the air, and more of it drains to the river. Similarly, Russell said much of the watershed's natural, perennial vegetation has been converted to row crop agriculture. Russell said that, while natural landscapes absorb and evapo-transpire water effectively for much of the year, annual crops like corn or soybeans only consume water during a portion of the year. He said this reduction in evapotranspiration results in increased runoff - and higher overall river flows. When combined, these factors have fundamentally altered the ability of the land to store and evaporate water. As a result, the water cycle has been altered, and more water runs into the river with each precipitation event - with potential impacts on erosion, streambank stability and runoff pollution.

Russell said the report includes several management solutions to addressing increased flows. He said that natural hydrology can be restored in agricultural areas through improvements to drainage water management, changes to cropping systems, and projects that hold and store more water on the land.

In addition, increasing perennial vegetation on the landscape would help restore a more natural water cycle. Russell said such changes require a coordinated statewide effort, though individual residents can help maintain a healthy water balance by installing practices like rain gardens, rain barrels, pervious pavers, and by restoring native landscapes. He said these are proven strategies for reducing excess runoff and improving water quality in the Mississippi River.

Weller said microplastics are tiny pieces of plastic that are abundant in the environment and present potential risks to wildlife and human health. Research is underway to better understand the presence of microplastics in the metro river, but she said fibers are the most common microplastic in the metro river. Weller said microplastics are found in different shapes, which provide clues about their origins. They end up in the environment through the breakdown of litter, car tire wear, or after plastics in clothing and consumer products are washed down the drain. Weller said when consumers wash products containing microplastics down the drain (for example, via cosmetics or washing clothing), some of the plastics make their way through wastewater treatment plants. Weller said these systems are not designed to remove them, so they tend to ultimately end up in surface waters. Microplastics can also enter surface waters via runoff, when plastic litter breaks down in the environment, or via atmospheric deposition. These persistent environmental pollutants build up in organisms that ingest them, and move up the food chain.

Weller said consumers may be most familiar with microbeads, which manufacturers began adding to facial washes, toothpastes and other products as an abrasive agent in the late 1990s. She said researchers began discovering microbeads in surface waters by the mid-2000s. Microplastic fibers come from synthetic fabrics (e.g., microfleece, polyester, nylon), diapers and cigarette butts. Weller said microplastics are found in water bodies, the stomachs of aquatic animals, and sediment around the world, including in ocean sediment as much as three miles below the surface. While additional research is required, Weller said there are a number of potential risks associated with microplastic pollution. Ingested microplastics can cause digestive and reproductive problems, as well as death, in fish, birds and other animals. Because microplastics have been found in samples of fish, beer, sugar, honey and table salt, Weller said human exposure via seafood and other food sources may be a concern. Unhealthy additives in the plastic, including flame retardants and antimicrobials, have been associated with cancer and endocrine disruption in humans. Weller said microplastics can be carriers of other pollutants, which can accumulate at high concentrations on them. Since microplastics are a relatively new phenomenon in the environment, she said additional research will continue to shed light on the extent of their potential impacts on humans and wildlife.

Weller said Congress passed legislation in December 2015 to phase out plastic microbeads from personal care products, effective July 1, 2017. Until then, Weller said there are several ways concerned consumers can help reduce microplastic pollution. She said there are smartphone applications which allow consumers to scan product labels and determine whether they contain microbeads. Consumers can also choose clothing made from natural fibers, avoid single-use plastics such as plastic bags and take-out containers, and remain careful not to litter (perhaps especially cigarette butts) or flush plastic materials down the toilet.

Russell said nitrate pollution to the river has increased substantially, excess nitrate threatens human health and aquatic life, and is a primary contributor to the Gulf of Mexico "dead zone." He said nitrate concentrations in the river increased by 44% from 1976 to 2014 and, while the river meets drinking water standards, Minnesota lacks nitrate standards to protect aquatic life in the river. Russell said nitrate is an important form of nitrogen for plant life, but too much in waters can be harmful to fish and other aquatic life. Human activities can greatly increase nitrate levels, and excess nitrate can quickly enter surface waters and groundwater. Russell said nitrate levels above drinking water standards (10 parts per million) can pose human health risks, including the potentially fatal "blue baby syndrome" in infants. He said excess nitrate in surface waters interferes with the healthy growth and development of aquatic

life. Further downstream, surplus nitrate contributes to the “dead zone” in the Gulf of Mexico, where excess nitrogen feeds massive algae blooms each year. When the algae die and sink, their decomposition robs bottom water of oxygen (a condition called “hypoxia”), suffocating marine animals that are unable to escape. Russell showed the Board a satellite image of the dead zone, which in 2015 covered nearly 6,500 square miles of the Gulf.

In Minnesota, Russell said cropland is the dominant source, contributing 72% of nitrogen input to the Mississippi River. The largest source (48 percent) is from farm drainage systems, 21 percent is from cropland runoff leaching to groundwater and moving underground until it reaches streams, and 3 percent is from cropland surface runoff. Russell said other sources include atmospheric deposition, wastewater, forests and urban runoff. He said total nitrogen loads to the river are influenced by flow; as large volumes of water can move more nitrogen through the river system.

Russell said the river is the primary drinking water source for Minneapolis, St. Paul and a number of surrounding communities. As a result, the nitrate drinking water standard (10 parts per million) applies to the upper metro river. Russell showed the Board a map indicating that nitrate concentrations in the Twin Cities metro reach of the river meet the drinking water standard. He said nitrate concentrations decline slightly as the river travels through the upper portion of the metro area, and increase downstream due to the influence of the Minnesota River. Russell said the state is developing a nitrate standard to protect aquatic life in the river, but it is unclear whether the metro river will meet whatever standard is established. Nationally, Russell said excess nitrogen pollution remains a serious problem for the Gulf of Mexico and it is estimated that Minnesota contributes the sixth highest load (6%) to the dead zone.

Russell said there are a number of actions that could be taken to address excess nitrates. He said establishing a state nitrate standard to protect aquatic life is an important next step in managing the impacts of excess nitrate in Minnesota. While Minnesota does not have standards for the river locally, Russell said the state has set a goal of reducing the state’s share of nitrogen to the Gulf dead zone by 45 percent by 2040. He said achieving these reductions will require widespread improvements in agricultural drainage, fertilizer-use efficiency, and converting to more perennial crops. In addition, Russell said reductions in wastewater treatment plant loads and air emissions will help protect the river and restore the Gulf of Mexico for future generations.

Weller said that, while she and Russell provided a greater level of detail on the preceding topics contained in the report, they also wanted to briefly summarize some additional items included. She said that additional detail on these topics can be found in the full report.

Bacteria – Russell said portions of the river are impaired with excess bacteria, which can increase health risks for recreational users. *E. coli* data indicate the potential presence of pathogens in the river. Bacteria pollution comes from human and animal sources and Russell said swimming should be limited in impaired reaches of the river.

Phosphorus – Weller said portions of the metro river are impaired with excess phosphorus that harms aquatic life and recreation. However, phosphorus concentrations in the metro river have decreased by 35% since 1976. Weller said the Metropolitan Council wastewater treatment plants have reduced their phosphorus output by 88% since 2000.

Fish Survey – Russell said in 1926, a survey found just 2 live fish in the river between St. Anthony Falls and the Hastings Dam. Today, he said anglers have embraced the metro river as a world class fishery. Russell said there has been an increase in the diversity and quality of the river’s fishery, particularly smallmouth bass and walleye, since the 1970s. However, he said river managers lack complete data on species mix and trends.

Fish Consumption – Weller said fish from the river are safe to eat if you follow state fish consumption advice. She said, while fish are an important part of a healthy diet, fish can contain polychlorinated biphenyls (PCBs), mercury, and perfluorooctane sulfonate (PFOS). Weller said people should always follow site-specific consumption advice. Consumption guidelines are based on location, species, and whether you are a child or woman who is or may become pregnant, etc. Consumption guidelines exclude catch and release species, so Weller said anglers should reference both lists when fishing in the metro river.

Invasive Asian Carp – Russell said Asian carp are a group of invasive fish that pose a serious threat to recreation and ecosystem health and they continue to move into the metro Mississippi River. He said at least 19 Asian carp (including grass, bighead and silver carp) have been caught in Lake Pepin and the metro Mississippi River since 2011. Russell said changes in management of navigational locks have been made to slow the migration of Asian carp.

Mussels – Weller said some mussels populations are gradually being reestablished in the in the metro river. She said the presence of mussels is a good biological indicator of river health. River pollution eliminated mussels from much of the metro river in the early 1900s. Weller said mussel habitat is degraded below the confluence with the Minnesota River.

Bald Eagles – Russell said the metro river is home to a resilient population of bald eagles. Eagles along the river have made a dramatic comeback from near-extinction. Lead levels in nestlings are higher in the metro river corridor than elsewhere in the region. Levels of several other contaminants are declining, but remain cause for concern.

Sediment – Weller said the lower portion of the metro river is impaired due to excess sediment, which can harm aquatic plants and disrupt habitat for fish and other wildlife. She said about three-fourths of the river's sediment comes from the Minnesota River basin. And while levels fluctuate annually, Weller said the metro river is still carrying sediment at nine times its natural rate.

Chloride – Russell said the river meets standards for chloride, but levels have increased by 81 percent in recent years. He said chloride comes primarily from road deicing salt and water softeners and one teaspoon of salt is enough to permanently pollute 5 gallons of water. Russell said 39 local water bodies are impaired by excess chloride, including several river tributaries.

Pesticides – Weller said the metro river meets standards for pesticides used to control unwanted insects, weeds and other pests. At elevated concentrations, she said pesticides can harm aquatic life and beneficial pollinators. While some herbicides are frequently detected in the metro river, Weller said they are found at levels well below state standards.

Additional Contaminants of Concern – Russell said there are additional contaminants of concern that may negatively impact the health of the metro river. He said pharmaceuticals are repeatedly detected in rivers and streams and the presence of mercury and PFOS contribute to fish consumption advisories. Russell said triclosan-derived dioxins have increased up 200-300% in Lake Pepin sediment.

Weller said there are a number of pieces of good news covered in the 2016 State of the River Report. Positive trends in bald eagles, mussels, and fish population point to a restored river that is once again home to healthy and abundant wildlife. She said it is extremely positive that these improvements happened once people came together and decided they wanted to fix problems. Russell said it is also good news, at least for now, that the river currently meets standards for pesticides and chloride. However, he said vigilance is required to minimize the potential impacts of these pollutants over time.

Weller said several of the indicators included in the report are cause for concern. The river is impaired by excess sediment, bacteria and phosphorus, degrading aquatic habitat and recreation. Fish consumption guidelines are in place throughout the river due to elevated levels of contaminants like PFOS and mercury. While Weller said there is cause for optimism, she said it is clear that much more work remains to resolve these problems.

Russell said other indicators in the report are cause for alarm. He said flows have multiplied to worrisome levels, destabilizing the river system and delivering large amounts of pollution. Russell said nitrate concentrations have increased by 44 percent and invasive Asian carp continue to move upstream, with potentially devastating consequences to aquatic life and recreation. He said the solutions to these problems require new tools and determined public action before they move beyond our reach. Russell said microplastic fibers, pharmaceuticals and triclosan-derived dioxins in the metro river pose uncertain risks to aquatic life and health and additional research and collective action are required to mitigate their potential long-term impacts.

While the challenges facing the river are complex and daunting, Weller said it is clear that the Mississippi river remains a vital cultural, recreational, economic, and natural resource worthy of protection and restoration. She said Minnesotans value clean water, and want to do their part for a healthy river. Consequently, she said they have created a few companion documents to supplement the State of the River report. Weller said the Stewardship Guide offers steps that citizens can take in their home, yard, and community to help protect and restore the Mississippi River. She said they have also created a brand-new Teacher's Guide to help teachers and students carry the lessons of the report into the classroom.

Russell said that, while the National Park Service cannot make policy recommendations, the Friends of the Mississippi can. The organization developed a Policy Guide that offers priority actions that federal, state, and local leaders can take to address the issues raised in this report. Russell noted that it has been 45 years since the passage of the Clean Water Act, 28 years after the river became a national park, and 23 years after concerned citizens formed Friends of the Mississippi River. He said in that time great strides have been made in protecting and preserving this unique natural resource and they remain hopeful that with strong leadership and vocal support from river lovers across our state and nation, a cleaner, healthier and more vibrant Mississippi River can be passed on to future generations.

Weller said more information can be found on the State of the River Report website at: www.stateoftheriver.com

Robert Stout complemented Weller and Russell and their organizations on the accessibility of the report and on their presentation of the information contained in it. Barb Naramore suggested a minor change to the description of fish consumption advisories to include the size of the fish. Gretchen Benjamin suggested expanding the description of nutrient impacts to water quality to include local impacts in addition to impact to the Gulf of Mexico. Russell said he understood this perspective and the importance of making the impacts tangible in a local context.

Water Level Management (WLM)

MVS Adaptive Management Approach to WLM

Kevin Stauffer said the purpose of this discussion at the quarterly meeting is for all partner organizations to discuss their respective roles in improving water level management on the UMRS. He said many partners are interested in restoring low water levels for the benefits they provide for vegetation and fish and wildlife. Stauffer introduced Dave Busse and Brian Johnson who provided an overview of water level management in the St. Louis District of the Corps of Engineers.

Busse showed the Board a map of the St. Louis District. The District covers portions of the Illinois, Missouri, and Mississippi Rivers as well as a number of reservoirs, including Mark Twain and Wappapello Lakes in Missouri and Shelbyville, Rend, and Carlyle Lakes in Illinois. The St. Louis District is responsible for maintaining a navigation channel nine feet deep and 300 feet wide on 300 miles of the Mississippi River from Saverton, Missouri, to Cairo, Illinois. They are also responsible for maintaining a navigation channel on the lower 80 miles of the Illinois River as well as the lower 36 miles of the Kaskaskia River. The St. Louis District is also located at the critical transition point on the Mississippi River where it is a “locking river” north of St. Louis and the “open river” from St. Louis on south.

Busse said the District’s lock and dam (L&D) infrastructure includes L&D 24, L&D 25, Mel Price L&D, L&D 27, Low Water Dam 27, and the Kaskaskia L&D. He said there are two types of locks and dams, dam point control and hinge point control. In dam point control, the navigation pool is regulated at the lock and dam within 0.5 to 1.0-foot band limits. In hinge point control, the navigation pool is regulated from two points – the lock and dam and a location in the pool. Busse showed the Board several graphical depictions of the hinge point operations at Mel Price L&D.

Busse said environmental pool management began in the St. Louis District many years ago. At a 1994 annual spring coordination meeting, he said staff from the Missouri Department of Conservation proposed a study aimed at reducing water levels for 30 days. Instead of a study, he said Corps water control staff chose to simply implement the proposal. Since 1994, Busse said the St. Louis District has been able to achieve yearly environmental benefits by implementing environmental pool management, although the process has been abbreviated in certain years due to channel conditions. After the 20th year of implementing environmental pool management, in 2014 Busse said the Corps and partners began discussing the possibility of longer drawdowns. This discussion led to the creation of an Environmental Pool Management Project Delivery Team (PDT).

Busse said there are a few important goals related to environmental pool management, but the first is the provision of a safe and dependable navigation channel. He said several goals related to vegetative growth parameters have been developed. These include:

- Beginning pool drawdowns around April 1 before the majority of the fish spawn occurs;
- Continuing drawdowns from May 1 to July 30, as this period is the most suitable for vegetative growth and seed production;
- Targeting a minimum of a 0.5 foot drawdown for 30 days; and
- After initial drawdowns, allowing the pool to rise at a rate of less than 0.3 foot per day (the slow rise allows the vegetation to survive and continue to grow).

Busse said another critically important goal is close coordination with resource managers in the field. Environmental conditions will vary from year to year, and Busse said the time of year, temperature, and precipitation all have an effect on vegetation. Resource managers provide valuable insight into actual conditions and often play a role in suggesting needed adjustments.

Busse summarized environmental pool management operations in the St. Louis District in 2016. At L&D 24, they achieved a half-foot drawdown for 148 days, a foot drawdown for 97 days, and a 2 foot drawdown for 30 days. At L&D 25, they achieved a 1.5 foot drawdown for 139 days and a 2.5 foot drawdown for 61 days. At Mel Price L&D, they achieved a 1 foot drawdown for 192 days and a 2 foot drawdown for 110 days.

Biological Response to Pools 24-26 Drawdowns

Brian Johnson provided information regarding the biological response observed in response to environmental pool management in 2016. However, he began by referencing the observed biological response to the 2014 drawdown at Mel Price L&D. At this site in 2014, the Corps was able to achieve a 0.5-foot drawdown for 97 days, a 1 foot drawdown for 95 days, and a 2 foot drawdown for 80 days. Johnson showed the Board a series of photographs of the tremendous vegetative response to this longer duration drawdown at the Ellis Bay site in Pool 26 in 2014. Johnson also showed a series of photographs showing a similar response at the Pharris Island site in Pool 24 and in lower Pool 26 after the 2016 drawdowns. He provided charts of the average percent of cover by the species types observed in post-drawdown monitoring conducted using UMRR's Long Term Resource Monitoring (LTRM) protocol and made possible by funding through the Corps' Sustainable Rivers Program.

Johnson said the results from environmental pool management show its importance, with estimated benefits to over 3,000 acres in 2016. This estimate was developed by analyzing aerial imagery, but Johnson suggested that LiDAR imagery would help determine the acres exposed at various stages of drawdowns. Johnson said monitoring results showed good species diversity throughout the sites, more structural diversity, as well as consolidation of sediment. He said the vegetative response to environmental pool management also benefits the establishment of early successional forest, nutrient cycling, food availability for fish and wildlife, as well as habitat availability.

Johnson said consideration of future environmental pool management should consider what is possible. He said it will be important to be flexible in implementing what is achievable given the variety of constraints. However, he stressed that in water level management inches of drawdown creates acres of habitat and this habitat has compounding benefits. In response to a question from Bryan Hopkins, Johnson said additional study of the nutrient cycling potential of environmental pool management would be extremely helpful. In response to a question from Robert Stout, Dave Busse said the Corps is optimistic that LiDAR will be completed this year for Pools 24, 25, and 26 if conditions allow. In response to a question from Karen Hagerty, Busse said LiDAR collected through the UMRR program was not useable for this purpose as it was completed when water levels were high. In response to a question from Jim Fischer, Busse said mussels have adapted to drawdowns given the operation of hinge point dams. Gretchen Benjamin pointed out that analysis was conducted on mussel impacts prior to drawdown implementation.

Historical WLM Approaches and Observed Benefits

Tim Schlagenhaft provided some historical context to water level management in the UMRS. Before he joined Audubon four years ago, Schlagenhaft worked for the Minnesota Department of Natural Resources. He showed the Board a graphical depiction comparing natural flows to those observed after the creation of the lock and dam system and highlighted the loss of low water levels – especially during summer months critical to vegetation. He said there is an operating band that the Corps defines for each pool in the operating manual and water levels are managed within that operating band. Schlagenhaft said that operating band varies, with lower pools with mid-point control having a generally wider band (up to several feet), and upper pools with hinge-point control having a narrower band (typically 0.5 feet). He said operating bands have changed over time for the individual pools. As an example, he said the operating band for Pool 5 was 2.5 feet in the 1940s and 1950s, 1.5 feet in the 1960s and 1970s, and now it is 0.5 feet. Schlagenhaft showed the Board a series of maps depicting the vegetation present at a site in Pool 8 from 1975 to 2005 and said vegetation was abundant prior to the 1970s narrowing of the operating band. These maps also show the increase in vegetation after a Pool 8 drawdown and Schlagenhaft showed pictures of some of this response.

Schlagenhaft said Audubon is interested in working with the Corps and partner agencies and organizations to develop strategies to restore natural low water variability. He said some potential strategies to do this include:

- Implementing more frequent lock adjustments in all the pools to minimize fluctuations and manage water levels on the low end of the operating band;
- Continuing pool-scale drawdowns; and
- Establishing wider operating bands to provide more flexibility in managing water levels in upper river pools by creating and maintaining a deeper navigation channel.

Schlagenhaft said more frequent adjustments to hold river levels at the lower end of the operating band could create thousands of acres of habitat on the UMRS. While the effects would be more limited on the upper river, he said the Water Level Management Task Force is working with the St. Paul District on an issue paper regarding the potential for establishing a wider operating band in Pool 8. He said one scenario would be to dredge the channel 1.5 feet deeper once every five years and drawdown as channel conditions allow. Another scenario would be to dredge the channel 1.5 feet deeper every year. Schlagenhaft said this would require additional channel dredging and disposal, but that the initial cost increase could result in less required dredging in subsequent years. He provided some estimates for what these two scenarios might cost and said it is within the range of the typical cost for UMRR habitat projects.

Schlagenhaft suggested that one logical next step would be to expand the existing Water Level Management Task Force as it currently only involves the St. Paul District. He said partners have also discussed possibly convening a water level management workshop designed to develop a UMRS strategy and identify funding sources to implement it. In response to a question from Jim Fischer, Schlagenhaft said there would not necessarily have to be a specific ecological objective beyond restoring natural low water variability. Fischer said he understands the value of water level management, but some areas of the river have seen a rebound of vegetation and increased dredging required for drawdowns also increases the amount of material for disposal and has potential trade-offs such as mussel impacts. Chandler said one historic focus of ecosystem restoration on the UMRS has been the construction of islands to reduce wind fetch and increase vegetation, but she noted that these projects must be operated and maintained by the non-Corps sponsor. She suggested that water level management would benefit these and other habitats, while not requiring the same operations and maintenance obligations.

Discussion of Challenges and Opportunities for Large-Scale WLM on the UMRS

Stauffer invited partners to further discuss how water level management can be integrated into operations throughout the UMRS. Ken Barr noted that the Rock Island District began environmental pool management in Pool 13 in 1998 when the U.S. Fish and Wildlife Service proposed a 30-day drawdown. He said challenges with the hydrograph that year prevented full implementation of the proposed drawdown. In response to a question from Dan Baumann, Tim Yager said in past drawdowns there has been extensive outreach to stakeholder groups to discuss the purpose of the efforts and any implications. He said that, while there are always some concerns, they have largely been able to address them. The one exception was in Pool 6 when there was an issue with access to a marina. However, Yager said most people recognize the importance of maintaining vegetation – particularly those who hunt and fish.

Gretchen Benjamin said she has been working on environmental pool management since 1995 and she has always viewed drawdowns as an additive tool to the restoration accomplished under UMRR. She said water level management is not easily done through UMRR. Benjamin said we need UMRR to build islands and restore side channels, but we also need improved water level management so that the

restored habitats function. She suggested that additional monitoring and analysis of the benefits of drawdowns (nutrient cycling, vegetative growth, water quality, etc.) needs to be conducted by agencies such as USGS. Benjamin said the increase in vegetation resulting from restoring low water variability is just one visible manifestation of the restoration of a myriad of ecological processes. She said she is excited about working with UMRS partners on ways to undertake more systemic approaches to water level management.

Marv Hubbell said that Corps guidance from 2000 says that UMRR can undertake large-scale water level management. He noted that the UMRR program is currently undertaking the second iteration of a Habitat Needs Assessment as well as a resiliency initiative. These will be used to inform the process of selecting the next generation of UMRR projects, but Hubbell said water level management could also be considered. Sabrina Chandler noted that the U.S. Fish and Wildlife Service is the non-Corps sponsor of 70 percent of UMRR projects, but she said environmental pool management has tremendous potential to improve lands adjacent to the refuge.

Robert Stout suggested that UMRBA host a workshop with UMRS partners to further discuss and develop water level management strategies. Dru Buntin said UMRBA would work with partners to develop the proposed focus of such a workshop and suggested that anyone interested in participating should contact UMRBA staff.

Justin Sexton said he has been involved in several success stories at the Two Rivers National Wildlife Refuge with both water level management and UMRR HREPs. He said an HREP at Swan Lake built a levee and installed a pump to facilitate water level management. This allows drawdowns to provide overwintering habitat for waterfowl as well as vegetative growth. Sexton suggested that the Corps' stewardship program might be one potential source for monitoring funds for water level management. Chandler said it is important to understand that drawdowns improve vegetation in the river, but they also benefit land management. Dave Busse noted that drawdowns entail much hard work by lock and dam managers as there are numerous gate changes that are required to maintain desired water levels.

Fischer said Wisconsin does not oppose drawdowns, but he suggested there may be more tradeoffs in the northern portion of the river. He noted a white paper being developed regarding Pool 8 water level management might inform some of the consideration. He said he supports the idea of a workshop to further discuss the details. Tim Schlagenhaft said Pool 8 offers an excellent opportunity for experimenting on water level management. Barb Naramore said she supports the concept of a workshop and suggested that it focus on cases where drawdowns have been implemented and the results as a starting point for discussion. She said the workshop could also include discussion of how drawdowns relate to other restoration tools as well as any potential policy roadblocks to implementation of a more systemic approach. Consequently, it might be advisable to break the workshop into sessions on discrete topics. Dan Baumann said he too supports convening a workshop. Hubbell noted that UMRR program partners are involved in discussion related to water level management and it would be appropriate to include some of them as well. Buntin reiterated that UMRBA staff would convene a call regarding development of the workshop. Kevin Stauffer suggested that the core group of staff involved in planning today's discussion serve as the planning group for the workshop. Buntin agreed and said anyone wishing to participate should contact him or Kirsten Mickelsen.

Insights from UMRS Watershed Studies

Illinois and Kaskaskia River

Monique Savage provided the Board with an overview of two studies focused on watersheds of the Illinois and Kaskaskia Rivers. She said the Illinois River Basin Restoration Watershed Plan (Comprehensive Plan) has an authorization similar to the Kaskaskia Feasibility Study and was

completed in 2007. The Illinois River Comprehensive Plan identified several ecosystem restoration projects for further feasibility analysis, but Savage said no projects have been constructed nor have further feasibility analysis been conducted.

Savage said the Kaskaskia River Feasibility Study is focused on ecosystem restoration in the watershed. The study requires a 50 percent nonfederal cost share, must be completed in three years, and has a maximum cost of \$3 million. Savage said the National Great River Research and Education Center (NGRREC) is the nonfederal sponsor of the study. The Kaskaskia study is intended to identify constructible projects within the Corps' mission areas.

Savage showed the Board a map of the Kaskaskia study project area, which includes over 3.6 million acres and approximately 300 river miles. The Corps' navigation project on the Kaskaskia River includes the lower 36 miles and there are two reservoirs in the project area (Carlyle Lake and Lake Shelbyville). Savage said the study is dividing the project area into four distinct reaches, including:

- Reach I – Champaign, Illinois to Shelbyville
- Reach II – Shelbyville to Carlyle Dam
- Reach III – Carlyle Dam to Fayetteville, Illinois
- Reach IV – Fayetteville to Mississippi River Confluence

Savage said at the beginning of the study, they brought in four local watershed organizations to discuss the various factors impacting the study area. This led to the development of a conceptual ecological model. Savage showed the Board a graphical depiction of the model and its drivers, including climate, geology, ecological disturbance, and land use.

Savage outlined several limitations of the Kaskaskia study. To reduce costs, she said they are using existing data from a variety of sources as opposed to collecting additional data. Funding limitations also reduced the study scope to focus on the mainstem of the Kaskaskia River, while acknowledging the need for future work on the tributaries. Savage said one challenge is determining naturally occurring bank erosion versus that resulting from land use or other changes. Savage said they have further focused on the most altered riparian areas within the mainstem of the Kaskaskia River and she showed the Board a map of these areas.

Savage suggested several considerations from the Kaskaskia study that should be taken into account on other watershed-focused studies. She said it is important to clearly define the study purpose, identify key stakeholders that need to be involved, and determine constraints such as budget and schedule at the outset. It is also important to identify the roles and responsibilities of partners as well as the strategies for resolving any disagreements. Savage suggesting using existing or surrogate data is often necessary in these types of studies and she said it is important to manage people's expectations throughout the process. In response to a question from Bryan Hopkins, Savage said it is important to clearly articulate to identified key stakeholders the study scope and limitations will be and get their input on how to target limited resources. Robert Stout agreed that it is crucial to have a robust engagement strategy at the outset of these types of studies to get agreement from key parties on the focus.

Minnesota River

Jason Smith provided an overview of the Minnesota River Integrated Watershed Study. He said there are differences between a watershed-based approach and a watershed study and noted that he teaches a course on watershed studies. In a watershed-based approach, Congress and/or the sponsor clearly define the study scope to include watershed variables influencing a specific area of interest and there is typically limited stakeholder engagement. In a watershed study, Smith said the sponsor and stakeholders help develop the scope of the study in a visioning phase and watershed variables influence

numerous areas of interest and the metrics and evaluations often include elements outside of the Corps' mission areas. He said there are three types of watershed studies: strategy-based assessments, mission-focused assessments, and trade-off based assessments focused on integrated water resources management.

Smith said the Minnesota River study products will include an integrated comprehensive plan for the watershed and a digital decision support system consisting of data and a family of process-based simulation models. He said it is designed to take a quick inventory of the challenges and potential solutions and then convene partners to address the different areas. This could include the Natural Resource Conservation Service (NRCS), the Corps, the U.S. Fish and Wildlife Service, or state agencies. Smith showed the Board a graphical depiction of the conceptual model developed for the study. It includes future watershed scenarios and factors such as land use, climate, and hydrology. Given the multiple watershed drivers, Smith said they are taking a tiered approach to the study. Tier 1 is fundamentally simple, provides a relative sense of conditions and requires few input data. Tier 2 provides a level of certainty to model economic and environmental impacts and requires more input data. Tier 3 includes detailed, physically-based processes and requires much more input data. Smith said a multi-tiered approach measures a multiple scales and he provided some examples of each tier.

Smith said they are using a GIS-staking approach to project future water quality scenarios in the Minnesota River watershed. He said these scenarios could consider likely future conditions with the implementation of the State of Minnesota's new buffer law or with implementation of a TMDL. He said these scenarios can be run through various models to quantify tradeoffs. Smith said the study also seeks to identify target metrics, and he suggested these could come from TMDLs or from the state nutrient reduction strategy for example. Smith said one challenge will be reconciling these multiple metrics in order to take landscape characteristics and map and model them to identify scenarios where future goals are achieved. He said they are also considering how to develop the best user interface for the decision support system to allow visualization of the information. In response to a question from Brian Weigel, Smith said most Corps economic models account for impacts to the floodplain and other things such as market value or easement value.

Regional Flood Risk Management

Scott Whitney provided the Board with an update regarding UMRS regional flood risk management. He noted that during the Mississippi River Commission's low water inspection tour of the Upper Mississippi River in August, one of the Commissioners pointed to the lack of a shared vision for flood risk management. Whitney said he heard similar perspectives from levee districts at the August levee summit in Hannibal, Missouri hosted by the Upper Mississippi, Illinois, and Missouri River Association (UMIMRA). Whitney said the changes that have occurred over the past 50 years underscore the need for risk-informed decision making. He said this entails increasing awareness and understanding in order to identify actions and the development of a UMRS HEC-RAS model will help assist in this.

Whitney said the scope of the HEC-RAS model includes developing a computation model to allow for wider use for floodplain management in support of flood risk management, flood preparedness operations, and Section 408 levee modification studies. He said the model will provide a base condition to evaluate proposed changes to the system. Whitney said coordination with other Corps districts as well as other federal and state agencies will be required and an Interagency Team has been established to do this. The team includes representatives from the States of Illinois, Iowa, Minnesota, Missouri, and Wisconsin, St. Louis and Rock Island Districts of the Corps, the Federal Emergency Management Agency (FEMA), the National Weather Service, the U.S. Geological Survey (USGS), and the Mississippi Valley Division (MVD) of the Corps.

Whitney showed the Board a map of Phase I of the hydraulic model development, which includes the Mississippi River from Lock and Dam 19 to Thebes, Illinois with 320 river miles and seven dams. Whitney provided additional detail regarding the scoping process, including anticipated web-based meetings with the Interagency Team. As it stands, Whitney said the HEC-RAS model development includes:

- Updating model geometry with best available terrain and bathymetric data
- Horizontal Projection
- Two levee crest elevation geometries using most recent elevation data and authorized levee elevation criteria
- HEC-RAS 2D modeling to be used in storage areas behind levees
- Lock and dam structures, bridges, piers, embankments perpendicular to flow
- Cross-section locations consistent with the 2004 Upper Mississippi River System Flow Frequency Study
- Tributaries evaluated by size and extent, including existing tributary models
- Adding un-gaged inflows and communicating with hydrologic modelers so the hydraulic model will ultimately work with hydrologic models
- Developing calibration parameters for specific flood events prior to levee overtopping

Whitney said the Corps also plans to use the model as a tool to compare authorized levee elevations to the 2016 levee elevation survey results. He said a related task is defining a procedure for applying the HEC-RAS model to Section 408 levee modification studies. Whitney provided information regarding the status of the various sub-items included in the scope and said the Corps anticipates completing Phase I by September 30, 2017. During HEC-RAS model development, Whitney said the Interagency Team will develop a process to maintain the updated model, document model updates, and communicate updates to the public. They will also develop a quality assurance/quality control review process for any model updates. Whitney said the Corps estimates the total HEC-RAS model cost to be \$2 million, with Phase I comprising \$500,000 of this total.

Robert Stout complemented the Corps on the transparent process used in developing the HEC-RAS model. In response to a question from Stout, Whitney said he was unaware if the HEC-RAS model would be compatible with the specific case of a National Oceanic and Atmospheric Administration (NOAA) model update that Stout cited. However, he said the general goal is to make the hydraulic model usable for a broad range of applications and he indicated that he would follow up with NOAA.

Mike Klingner expressed his appreciation for UMRBA's participation in the UMIMRA Levee Stakeholders Summit. He said it was the first time that all levee districts from Cairo, Illinois and up the river had been invited to one discussion. Klingner said one notable development at the summit was that some levee districts expressed a willingness to discuss taking on water in a managed way during flood events.

Navigation Program Update

Kirsten Mickelsen provided an update on UMRBA's Navigation Program, including activity related to Mississippi River container shipping, the M-35 Marine Highway Corridor, economic valuations of commercial navigation, and Association advocacy. Mickelsen said several factors are combining to focus interest and attention on container shipping on the Mississippi River. She said by 2045 the United States economy is forecast to grow by 115 percent to \$36.7 trillion and the transportation sector is expected to represent approximately \$1.6 trillion of total gross domestic product (GDP). Mickelsen said

increasing exports and the country's energy boom is placing an unprecedented demand on the transportation system. She noted that crude oil production is up by 50 percent since 2008 and 400,000 carloads of crude oil were transported by rail in 2013. By 2040, it is projected that United States freight volume will grow by 45 percent to 29 billion tons and Mickelsen noted the capacity constraints experienced in recent years in the rail and road modes. She said the expansion of the Panama Canal also presents an opportunity for additional container capacity to be developed on the inland waterways.

Mickelsen provided the Board with information regarding the structure of the Maritime Administration's (MARAD) Marine Highway Program. She noted that MARAD has designed the M-35 and M-55 Marine Highway Corridors in the UMRS and has designated container on barge as an eligible project. Mickelsen said both of these criteria must be met in order to be eligible for MARAD grant funding. She said MARAD recently announce six grants for projects under the Marine Highway Program and three of these are on the Mississippi River. These include a container on barge shuttle project in Illinois, a project sponsored by the Ports of Baton Rouge and New Orleans, and a container on barge planning project on the M-55 and M-35.

Mickelsen said the planning project is sponsored by the Port of St. Louis along with UMRBA, the Mississippi River Cities and Towns Initiative (MRCTI), and the Inland Rivers, Ports, and Terminals Association (IRPT). She said the \$96,000 grant awarded by MARAD requires a 20 percent match and will focus on convening conversations among shippers and carriers to facilitate service development. Mickelsen noted that the specific details of the planning grant project are still being developed by the partners.

Mickelsen said UMRBA staff are working with the state departments of transportation to develop a GIS-based UMRS asset inventory as suggested by the M-35 Advisory Committee. She said the asset inventory is envisioned to include:

- Ports and terminals
- Major railways and highways
- Fleeting areas
- Foreign trade zones
- Links to Corps of Engineers channel maintenance and placement area maps

Mickelsen noted that the port and terminal information will include the address, river mile, capacity, and recent or planned expansion. She said capacity information will include terminal specialty, commodities handled, rail access, and warehouse and storage capacity. Mickelsen said additional M-35 related activity is planned to include joint advocacy for infrastructure improvements as well as pursuit of a meta study to answer specific questions regarding freight management and inland waterways.

Mickelsen shared with the Board the results of an Economic Impact and Cluster Analysis of Illinois River Locks and Dams prepared by the Economic Development Research Group for the Illinois Chamber of Commerce, the Illinois Soybean Association, the Illinois Corn Marketing Board, the Illinois Farm Bureau, and the Chemical Industry Council of Illinois. She said the study analyzes several scenarios and the expected economic impact, including:

- Scenario A – La Grange Lock Expansion (\$27.4 million)
- Scenario B – Peoria Lock Expansion (\$27.58 million)
- Scenario C – Lock Rehabilitation Only (\$28.19 million)
- Scenario D – La Grange Lock Expansion and Rehabilitation (\$49.67 million)
- Scenario F – Expansion and Rehabilitation (\$69.43 million)

Mickelsen also provided an overview of an economic impact analysis conducted by the U.S. Department of Agriculture regarding closure of UMRS locks. The report concluded that a closure of Lock and Dam 25 would impact 7,000 jobs, \$1.3 billion in labor income, and \$2.4 billion in economic activity. It projected that closure of La Grange Lock and Dam would impact 5,500 jobs, \$900 million in labor income, and \$1.8 million in economic activity. Mickelsen noted that the Mid America Freight Coalition would be conducting related research regarding the impact of closures in the near future.

Mickelsen said the Association continues to work with partners on advocacy for UMRS navigation-related issues. This includes supporting funding for the Navigation and Ecosystem Sustainability Program (NESP), major rehabilitation of UMRS locks and dams, operations and maintenance, and watershed planning.

Administrative Issues

FY 2017 Budget Amendment

Dave Frederickson offered and Tim Hall seconded a motion to adopt amendment #2 to UMRBA's FY 17 budget reflecting additional income projected as a result of the State of Illinois' payment of their FY 16 water quality assessment (\$17,000). The motion passed unanimously on a voice vote.

Future Meeting Schedule

Stout said the next meeting series will be held February 7-8, 2017 in Rock Island, Illinois with the UMRBA quarterly meeting on the 7th, and the UMRR Coordinating Committee on the 8th. The May meetings will be held May 23-24, 2017 in St. Louis, Missouri with the UMRBA quarterly meeting on the 23rd, and the UMRR Coordinating Committee on the 24th. The August quarterly meetings will be held August 8-9, 2017 in La Crosse, Wisconsin with the UMRBA quarterly meeting on the 8th, and the UMRR Coordinating Committee meeting on the 9th.

With no further business, Tim Hall offered and Rick Gosch seconded a motion to adjourn. The motion passed unanimously, and the meeting adjourned at 3:58 p.m.