



# LOWER MINNESOTA RIVER WATERSHED DISTRICT

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June 2024 Administrator report  
From: Linda Loomis, Administrator  
To: LMRWD Board of Managers

In addition to items on the meeting agenda, the following District projects and issues were addressed during the month:

## **Other Work**

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### **Recognition of Contribution to LMRWD by Manager Laura Amundson**

At the May 15, 2024, Board of Managers meeting, the Board asked the Manager Amundson be invited to a future meeting of the Board, to receive recognition and thanks for her contributions to the Lower Minnesota River Watershed District. Manager Amundson is not available for the next three months. She is not sure of her schedule after that. She thanked the Board for the invitation, but declined, since her availability is so long after her departure from the Board.

### **Federal Regulation of PFAS**

In April 2024, EPA issued the first-ever national, legally enforceable drinking water standard to protect communities from exposure to harmful PFAS. The final rule will reduce PFAS exposure for approximately 100 million people, prevent thousands of deaths, and reduce tens of thousands of serious illnesses. EPA concurrently announced a further \$1 billion to help states and territories implement PFAS testing and treatment at public water systems and to help owners of private wells address PFAS contamination. For more information Managers can visit:

<https://www.epa.gov/sdwa/and-polyfluoroalkyl-substances-pfas>.

The LMRWD is concerned with this issue, because of the impact this may have on disposal of dredge materials.

### **Hennepin County Chloride Initiative**

In 2019, watershed districts within Hennepin County agreed to allocate Watershed Based Implementation Funding on a County wide Chloride project. A group of watershed officials retained the services of a consultant and developed a tool kit for local governmental units to use to educate the public and others about salt usage. The website is [Low Salt/No Salt Minnesota](#) and is hosted by the Riley Purgatory Bluff Creek Watershed.

On May 21<sup>st</sup>, the Hennepin County Chloride Initiative held a meeting to discuss the accomplishments of this project and next steps. It was reported that the MN Nursery and Landscapers Association has agreed to legislation that was introduced near the end of the session, but too late to get a hearing.

### **MS4 (Municipal Separate Storm Sewer System) Determination**

The LMRWD has received notification from the MPCA that it identified the LMRWD as an MS4 subject to regulation under Minnesota Rule 7090, which requires the LMRWD have a general

municipal stormwater permit. The LMRWD will receive a letter of notification from the MPCA, with instructions for appeal of the MPCA determination.

**Lake Pepin Legacy Alliance**

The Lake Pepin Legacy Alliance has prepared a Water Quality Evaluation of Lake Pepin and South Metro Mississippi River report. The report was prepared by Norman Senjem. (The LMRWD retained Mr. Senjem to research and prepare responses on behalf of the LMRWD to TMDL studies and WRAPS reports in the MN River basin.)

The Lake Pepin Legacy Alliance has scheduled a meeting with the MPCA to discuss the report and has invited the LMRWD. The meeting is scheduled for Friday, June 28, 2024, from 1:00 to 3:00 pm and will be held at the MPCA. The report is attached for the Board’s information.

**2024/2025 Watershed Based Implementation Funding (WBIF)**

Convene meetings have been held for all the Watershed Planning Areas (WPA), with the exception of the Lower Minnesota River East. The LMRWD convened the meetings to determine the allocations for the Lower Minnesota River WPA and was invited to participate in the Scott County WPA convene meetings. Allocations of funds for the Lower Minnesota River WPA were determined as follows:

City of Shakopee	Stormwater BMP Near Market Street and Bluff Avenue	\$87,743
City of Chaska	Seminary Fen Ravine C-2 Stabilization Project	\$87,742
Scott SWCD	Targeted BMPs in Lower MN River Planning Area	\$7,000
City of Savage	Enhanced Street Sweeping Management Plan and Purchase of a Regenerative Air Sweeper	\$35,000

The City of Shakopee project funded by the Lower Minnesota River WPA Convene group is the same project that received funding under the Scott County WPA. This project was identified under a previous project funded by WBIF – Downtown Shakopee Stormwater BMP study.

The City of Chaska project received funding from the Carver County WPA. Chaska also received a Clean Water Grant for its project. The Scott SWCD will use the funds to provide technical and cost share assistance to resident within the LMRWD.

The City of Savage is planning to replace a street sweeper. They would like to upgrade the equipment to a regenerative sweeper that will pick up more salt residue. Before purchasing the upgraded street sweeper, they will undertake a study to determine best practices for protecting water bodies in the city, including Eagle Creek and Credit River.

The LMRWD will need to prepare a report to BWSR with the outcome of the convene process.

Here are the funding allocations for specific planning areas:

Planning Area 56	Lower Minnesota River East	\$538,396	2024
Metro	Carver County WPA	\$721,325	2025
Metro	Lower Minnesota River WPA	\$217,485	2025
Metro	Scott County WPA	\$646,054	2025

### **FY 2022 Financial Audit**

Redpath and Company will begin the LMRWD FY 2022 Audit at the end of the month. Clifton Larson Allen has indicated that they will have the information Redpath needs to complete the audit ready by then. The LMRWD is making sure all the information has been provided.

### **Minnesota Watershed Summer Tour**

Registration for the Summer Tour is still being accepted. Managers may attend, although there will be a higher cost for non-members registration

### **eLink Reporting**

Elink reporting has been completed and on May 28<sup>th</sup>, the LMRWD received the final payment of the 2021 WBIF grant received for work on Area #3.

### **Upper Mississippi River Waterway Association**

The June 2024 meeting of the Upper Mississippi River Waterway Association will be held in La Crosse Wisconsin. A tour of Lock & Dam No. 7 is planned to observe dredging operations and challenges facing the area. The meeting is being held at the Hatchery located in Riverside Park. Managers are invited to attend (there is no cost for this meeting), but registration is requested. Here is a link to registration: <https://umwa.net/columbia-snake-river-exchange-tour/>.

### Meeting Agenda

June 24, La Crosse, Wisconsin

11:45 a.m. – Lunch sponsored by J. F. Brennan Co.

The Hatchery, 410 Veterans Memorial Dr., La Crosse, WI

12:20 p.m. – Membership meeting

2:00 p.m. – Depart for barge tour to Lock 7. All barge participants must complete a release form before the tour.

3:45 p.m. – Optional tour of J. F. Brennan Company, Inc. Corporate Headquarters at 818 Bainbridge Street, La Crosse, WI

J. F. Brennan Company is a specialty marine contractor for environmental, dam construction, submarine cabling, harbor management, and commercial dive services.

### **Minnesota River Congress**

The Minnesota River Congress held its meeting June 13, 2024, at the Kato Ballroom in Mankato. About 65-70 people attended. Rita Weaver and John Jaschke from the MN Board of Water & Soil Resources gave an update of the Water Storage Initiative. Attendees were asked to complete a short questionnaire about forming a MN River Basin organization.

### **MPCA – Lower Minnesota River Watershed Assessment**

There is no new information to report on this item, since the last update.

Information for the previous round of assessments can be found by visiting the MPCA website using this link: [Lower Minnesota River Watershed](#). The last assessment was completed in 2015.

### **Watershed Plan Projects**

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**LMRWD Water Resource Restoration Fund:** An application from the City of Eden Prairie was approved by the Board at its April 17, 2024, Board of Managers meeting. Staff is developing a cooperative agreement between the LMRWD and the City.

**MAC Boundary Adjustment:** A report on this item is on the June 2024 Board of Managers meeting agenda.

**Eagle Creek Bank Restoration at Town & Country RV Facility:** No new information to report on this project since last update.

**Fen Private Land Acquisition Study:** There is no new information to report since the last update on this project.

**Spring Creek:** The LMRWD met with one of the property owners to make sure the design was satisfactory. The LMRWD has not been able to contact the second property owner.

Project website: <https://lowermnriverwd.org/projects/spring-creek>

**Gully Inventory and Assessment:** An update on the LMRWD gully inventory and assessment is included in the work plan update that in on the April 17, 2024, Board of Managers meeting agenda.

Project website: <https://lowermnriverwd.org/projects/mn-river-corridor-management-project>

**Minnesota River Study Area #3:** An update on the Minnesota River Study Area #3 will be provided to the Board at the June 20, 2024, Board of Managers meeting agenda.

Project website: <https://lowermnriverwd.org/projects/study-area-3-eden-prairie>

**Minnesota River Floodplain Modeling:** There is no new information to provide to the Board since the workplan update provided at the April 17, 2024, Board of Managers meeting.

**Vernon Avenue Dredge Material Management:** LMRWD funding of this project needs to be determined before the project can go out for bid. The LMRWD received notification from BWSR that state funds can be used to repay debt for this project. The LMRWD is meeting with David Drown June 18, 2024 and a presentation to the Board of Managers is planned for the July 17, 2024 meeting.

**Geomorphic Assessments (Trout Streams):** There is no new information to report to the Board since the workplan update provided at the April 17, 2024, Board of Managers meeting.

**The following projects are projects that are planned by LMRWD partners. LMRWD partners are leading these projects, the LMRWD has agreed to contribute to the projects:**

**Seminary Fen Ravine Restoration Area C2:** An update on this item is provided above under the WBIF report.

Here is a link to the [feasibility report](#) Area C-2.

**Shakopee Riverbank Stabilization:** This project did not receive additional funding this legislative session. The project the City of Shakopee has submitted under the WBIF program is part of this project.

Project website: <https://www.shakopeemn.gov/living-here/street-infrastructure-projects/minnesota-riverbank-stabilization>

**Carver Levee:** This project did not receive additional funding this legislative session.

Project website: <https://www.cityofcarver.com/276/Levee-Certification>

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## Upcoming meetings/events

*Managers are invited to attend any of these meetings. Most are free of charge and if not the LMRWD will reimburse registration fees. Please contact LMRWD administrator if you have any questions.*

- Lower MN River East 1W1P Policy Committee meeting – Thursday, June 20, 2024, 3:00 pm to 5:00 pm, [virtual only on MS Teams](#)

- UMWA (Upper Mississippi Waterway Association) monthly meeting – Monday, June 24, 2024, 12:00 noon to 4:00 pm, J. F. Brennan, 818 Bainbridge Street. La Crosse, Wisconsin, includes tour of Lock & Dam #7 and discussion of dredging activity of Upper Mississippi waterway
- [Minnesota Watershed Summer Tour](#) – June 25-26, hosted by Capitol Region Watershed District at the Essence Center, 1217 Bandana Boulevard, St. Paul
- LMRWD Citizen Advisory Committee meeting – Tuesday, July 2, 2024, 4:30pm
- 2024 Salt Symposium (25<sup>th</sup> Anniversary) – August 6 & 7, 20% discount Early Bird Pricing until June 30, 2024. LMRWD receives one complimentary registration as a Bronze level sponsor.

# Water Quality Evaluation of Lake Pepin and South Metro Mississippi River

June 2024 Working Paper, Lake Pepin Legacy Alliance\*

**Abstract:** The Lake Pepin Legacy Alliance (LPLA) is a grassroots organization whose mission is to protect and restore Lake Pepin's water quality, wildlife habitat, public accessibility, and recreational opportunities for everyone along the Upper Mississippi River. We have reviewed information from government agencies collected over the past decade to evaluate progress toward attainment of goals for water clarity and ecological health in Lake Pepin and upstream in the south metro Mississippi River. Overall trends point to a resilient aquatic ecosystem. Although the standard for total phosphorus in Lake Pepin is not being met, the response indicator, chlorophyll-a, is achieved often, owing to higher river flows and significant reductions in upstream point sources of phosphorus. Standards for water clarity, specifically total suspended solids (TSS), established for the south metro Mississippi River, are close to attainment near Red Wing, accompanied by markedly increased frequency of desirable rooted vegetation in backwater lakes. Upstream at Lock & Dam 2, however, concentrations of TSS remain well above the standard, owing to continued high pollutant loadings from the Minnesota River basin. Significant reductions in pollutant loads will require targeted efforts to control erosion of stream banks, bluffs, ravines, and farm fields. Success in such an effort could help to secure positive trends in and above Lake Pepin, and extend ecological and recreational benefits, including an improved fishery, upstream to Fort Snelling and throughout the Minnesota River Basin.

## Introduction

The water quality of Lake Pepin and the upstream Mississippi River has been subject to considerable scrutiny and study in recent years. Severe eutrophication and fish kills in Lake Pepin in 1987 and 1988 led to studies of in-lake biochemical dynamics and upstream sources of phosphorus enrichment. Suspended sediment was found to be a major source of phosphorus and a cause of excessive turbidity which impedes the penetration of light and thereby limits the growth of aquatic vegetation. Sediment core analysis revealed that the rate of deposition of suspended solids in Lake Pepin has increased 10-fold since pre-settlement times. The upper lake is rapidly becoming shallower, and its aquatic habitat degraded, as a result.

In 2015 the LPLA requested the U.S. Army Corps of Engineers to conduct a feasibility study for a project to restore ecosystem and recreational features in the upper lake. The study led to a \$22 million project which utilizes dredged material generated from Lower Pool 4 to improve the ecosystem at the head of Lake Pepin. Scheduled for completion in 2026, it includes three peninsulas, two backwater overwintering areas, access dredging, shoreline protection and a water level management dike that create a range of habitat types for fish and wildlife. An

additional \$8 million has been obtained for work near Bay City, plus \$12 million for project design work in Wacouta Bay, for a total of \$42 million.

The lifespan and effectiveness of these projects, and the health of the aquatic ecosystem throughout Upper Pool 4, depends on achieving significant reductions in sediment loadings from upstream. Water quality standards developed by the Minnesota Pollution Control Agency (MPCA) and approved by the U.S. Environmental Protection Agency in recent years define the targets for successful restoration and protection of the Mississippi River from its confluence with the Minnesota River to Lake Pepin.

### **Water Quality Standards**

From 2010 to 2015 the MPCA developed water quality standards to address eutrophication impairment of Lake Pepin and turbidity impairment of the Mississippi River from the confluence with the Minnesota River to upper Lake Pepin. Each standard includes a pair of numeric indicators – one to establish a maximum degree of *enrichment* by the pollutant in question, and the other to indicate a desirable level of ecological *response* to be expected from reducing the concentration of the pollutant. For the Lake Pepin eutrophication impairment, the enrichment indicator was established as 0.100 mg/L total phosphorus (TP), and the response indicator set at 0.028 mg/L chlorophyll-a, as a lake-wide summer average. Upstream, the summer (June-Sept) TP/chlorophyll-a criteria at Lock and Dam 2 are 0.125 mg/L TP and 0.035 mg/L chlorophyll-a. At Lock and Dam 3, the standard criteria are 0.100 mg/L TP and 0.035 mg/L chlorophyll-a.

For the Mississippi River turbidity impairment, the enrichment indicator was established at 32 mg/L total suspended solids (TSS) as a seasonal (June to September) average measured at monitoring sites at Lock and Dam 2 near Hastings, and Lock and Dam 3 near Red Wing. Attainment of this target in five or more years out of 10 is deemed sufficient to attain the desired response, defined as a 21% frequency of occurrence of submersed aquatic vegetation (SAV). This is roughly twice the historical frequency.

### **Total Maximum Daily Load Targets**

The MPCA employed Limno-Tech, Inc., to build a hydrodynamic model capable of assessing the impact of pollutant loads from upstream sources on water quality parameters for the south metro Mississippi River and Lake Pepin. The model was used to estimate the maximum loads of upstream phosphorus and sediment consistent with attainment and maintenance of standards for TSS and eutrophication. Results were published in TMDL reports required by the federal Clean Water Act. The findings are summarized as follows:

The South Metro Mississippi River TSS TMDL, approved in 2016, calls for a 50% reduction of resuspended sediment in upper Lake Pepin and reductions from upstream sources:

- 60% from the Minnesota River during high flows and 50% during average and low flows;
- 50% from the Cannon River;
- 20% from the Upper Mississippi River; and
- 20% from smaller rivers and streams that flow directly into the river.

Besides meeting the TSS/SAV standard, achieving these TMDL allocations would also reduce the rate of infilling of Lake Pepin by half, from a historical baseline of 0.8 cm/year to 0.4 cm/year, according to the Limno-Tech model.

The Lake Pepin and Mississippi River Eutrophication TMDL, approved in 2021, calls for the following reductions in loads of TP from upstream sources:

- 20% reduction in TP load from the Mississippi River at the Ford Dam (Lock and Dam 1);
- 50% reduction in TP load from the Minnesota River;
- 20% reduction in TP load from the St. Croix River;
- 50% reduction in TP load from the Cannon River;
- 20% reduction in TP load from other tributaries;
- 70% reduction from previously permitted TP loads for wastewater treatment plants; and
- 50% reduction in resuspension of TSS and TP in Pool 2.

### **Water Quality Trends**

LPLA reviewed monitoring and assessment information to evaluate whether water quality standards and TMDL targets are being achieved. Initial information indicates positive trends toward attainment of water quality goals.

TSS/SAV: The most recent 10 years of data from the Metropolitan Council’s monitoring sites at Lock and Dams 2 and 3 were obtained. The TSS criterion of 32 mg/L has been approached, but not fully achieved, at Lock and Dam 3 from 2014-2023. The 10-year median of TSS summer means was 36 mg/L. The median target was achieved in three years out of 10, two short of achieving the standard. The 90<sup>th</sup> percentile target of 44 mg/L was achieved in all years. TSS concentrations at Lock and Dam 2 were considerably higher, as expected, without the benefit of dilution by the St. Croix River. The 10-year median value was 50.5 mg/L and the 90<sup>th</sup> percentile target was exceeded in six of 10 years. At both monitoring sites, in the low-flow years 2021 to 2023 summer mean TSS values were close to or below the 32 mg/L median target, providing conditions for the potential re-establishment of SAV in shoreland areas and backwater lakes.

The prevalence of SAV in Navigation Pool 4 is regularly monitored by the USGS Long-Term Resource Monitoring program by DNR staff at Lake City. Monitoring data up to and including 2023 indicate that the target of 21% frequency of occurrence is being met in Lake Pepin and upper Pool 4. Upstream of the lake, the frequency of occurrence of SAV has ranged between 40 and 60 percent since 2016. Several backwater lakes have experienced an ecological shift from



high turbidity with little vegetation to clear water with abundant vegetation (Eric Lund, personal communication). In Lake Pepin, frequency of occurrence of SAV is ranging from 30 to 40 percent, with 60 percent achieved in 2023. The response component of the TSS standard is thus being achieved by a widening margin. Pools 2 and 3 are not being monitored for SAV.

In lower Pool 4, positive trends in SAV have been underway since 2010 after a four-year period of low river flows. Reduced turbidity and increased light penetration generated a widespread ecological shift that includes the return of healthy beds of wild rice and a fish community shift to more vegetation-associated, sight-feeding species. Bluegill, yellow perch, weed shiner and largemouth bass are more abundant in lower backwaters. (Burdis et al., 2020).

Similar widespread ecosystem shifts may be possible in Upper Pool 4 if current gains in SAV frequency are maintained. Early indications exist. However: "Without substantial sediment load reduction and further improvements in water clarity in upper (Pool 4) backwaters, any gains achieved from short-term low discharge events may not be sustainable and an ecological shift similar to what transpired in lower (Pool 4) backwaters is unlikely." (Burdis et al., 2020, p. 26).

TP/Chlorophyll-a: Eutrophication in Lake Pepin results from algae and diatoms produced within the lake, and that which is exported to the lake from upstream navigation pools. Data from upstream of Lake Pepin show summer TP levels moving in the right direction during all flow conditions. At Lock and Dam 3, the moving 10-year average for TP declined 27 percent from 0.202 mg/L in 2001, to 0.147 mg/L in 2023. This was due mainly to reductions of biologically reactive ortho-phosphorus from wastewater treatment facilities. Water quality standard criteria for TP and chlorophyll-a were met in recent low-flow summers, which tend to favor the growth of algae. By contrast, in the 2006-2009 low-flow period chlorophyll-a levels at Lock and Dam 3 were higher.

In Lake Pepin, criteria for the eutrophication standard have not been attained in the past 10 years for TP, but for six out of 10 years have been attained for the response indicator, chlorophyll-a. Nuisance algae mats were present for several weeks in a calm-wind period of the low-flow summer of 2021, when chlorophyll-a averaged about 0.60 mg/L, more than twice the standard criterion. But the severe hypereutrophic conditions of 1987-1988 have not recurred.

There is no Minnesota water quality standard for the rate of in-filling of Lake Pepin from sedimentation. Sediment core analysis shows that the trend is leveling off, following steep increases from 1940-1970 associated with the drainage of wetlands.

#### **TMDL load-reduction targets:**

Data from the Metropolitan Council monitoring site at Ft. Snelling were used to calculate TSS and TP loads from the Minnesota River up to and including 2021. In addition, the MPCA has developed a watershed pollutant load monitoring program (WPLMP) supported by funding from the Clean Water Legacy Act. Their web site for WPLMP displays river monitoring data for

the period 2007-2020. *Long-term stream trends in Minnesota*, also on MPCA's web site, presents monitoring data corrected for the effect of variations in stream flow. The following tentative conclusions are based on these data sources:

TSS loads: The largest single source of TSS to Lake Pepin is the Minnesota River basin. Increased TSS loads are evident at the mouth of the Minnesota River, particularly from 2016 to 2020, the only four-year period in the 48-year monitoring record to exceed 1 million metric tons annually. An upward trend persists along the mainstem upstream at Jordan, St. Peter and Judson. This trend may be primarily caused by increased river flow from higher snowmelt or rainfall runoff. It is in sharp contradiction to the 50-60% TSS load reduction called for in the South Metro Mississippi TSS TMDL report.

TSS Flow-corrected concentrations: The flow-corrected TSS concentration data for 2001 to 2020 show a negative trend at most monitoring sites in the Minnesota River basin (not including Ft. Snelling). This may indicate that land-use changes over the period would have resulted in reduced TSS loads were it not for higher rainfall and flows associated with climate change. This hypothesis warrants further study. If confirmed, it might suggest a reassessment of implementation plans and the selection of best management practices that would be more effective under more intense precipitation and higher flows.

- TP Loads: Data from the Metropolitan Council monitoring site near the mouth of the Minnesota River displays an upward trend for TP loads similar to the trend for TSS. This is despite substantial reductions in phosphorus discharged in wastewater. Statewide, the annual phosphorus point source load has been reduced by 67% from the 2000-01 baseline of 1,855,000 kilograms per year (MPCA website on April 24, 2024).

TP Concentrations: When data are corrected for the effect of flow variation, a significant decreasing trend in TP concentration is observed at all monitoring sites in the Minnesota River basin. It appears that the effect of flow variation masks improvements in water quality attributed to changes in land use and imposition of TP limits on wastewater effluent.

### **Remaining Question:**

TMDL studies assume that excessively high concentrations of pollutants can be reduced to desirable levels by controlling the mass of pollutants flowing into the body of water in question. Models are used to estimate the mass loading reductions that are required to achieve concentration targets of pollutants and corresponding ecosystem health. In examining empirical time series data related to South Metro Mississippi TSS TMDL, however, we have found that some targets for pollutant enrichment and ecological response are close to being achieved although load-reduction targets are not being met.

The Minnesota River accounts for 76-88 percent of the sediment entering the south metro Mississippi River and Lake Pepin. Contrary to the presuppositions of the TMDL, increasing loads of TSS from the Minnesota River from 2007 to 2020 coincide with a trend of increasingly

healthy beds of SAV in upper Pool 4 and the near attainment of the enrichment indicator of 32 mg/L TSS at Lock & Dam 3. One explanation is that high volumes of relatively clear water from the Upper Mississippi River and St. Croix River are diluting the concentration of TSS at Lock & Dam 3 sufficient to almost meet the water quality standard for TSS/SAV. Also, the highest TSS loads typically occur in spring, and may not contribute much to turbidity during the growing season for SAV from June through September (Dennis Wasley, private communication). These and other possible explanations should be investigated.

Weather trends also need to be considered. The past three years of dry weather and low stream flows likely created ideal conditions for increased growth of SAV in upper Pool 4. In certain backwaters, the aquatic ecology has shifted from a regime of high turbidity-low vegetation to one of low turbidity-high vegetation. If this shift becomes permanent, it could produce positive feedback effects by stabilizing river bottom sediments and reducing resuspension from wind and wave action. Evidence from lower Pool 4 indicates that changes in fish species composition are also likely. To secure these results, policy makers need to focus on ways to minimize the disturbance caused by high precipitation and river flows during the growing season for SAV.

When corrected for the effect of variable stream flow, TSS concentrations in the Minnesota River are seen to be declining. The reasons for this need to be elucidated. One possible influence may be changes in agricultural land use, such as implementation of the state's 50-foot buffer rule along streams and rivers. Other possibilities are increased surface crop residue on fields going into soybeans following corn, and the elimination of many surface tile intakes (personal communication, Pat Baskfield). Half of the cropland in Minnesota is estimated to be under conservation tillage or no-till (MPCA, 2020). Best management practices implemented through local conservation offices with increased technical and financial assistance from the Clean Water Legacy Act and federal conservation programs also play an important role.

Low river flows increase the residence time of water in Lake Pepin, creating ideal conditions for the reproduction of algae. Recent low-flow periods have not resulted in algae blooms as severe as in earlier low-flow periods, especially 1987-1988. Phosphorus concentrations have decreased, but whether the decline is sufficient to limit algae growth in Lake Pepin is uncertain. River discharge levels have remained higher in recent low-flow periods than earlier (approximately 6,000 cfs vs. 3,000 cfs, respectively), somewhat reducing the residence time of water in Lake Pepin. To what extent might climate change be affecting Mississippi River hydrology, such that higher river flows are maintained during periods of lower precipitation and runoff?

### **Conclusions and Recommendations:**

The favorable trends cited above should serve to dispel widespread attitudes of pessimism about the future of Lake Pepin and the Mississippi River. We can hope to undertake restoration efforts that until now seemed unlikely to succeed.

- Navigation Pool 2 Backwaters Restoration: The positive ecosystem shifts in Pool 4 may serve as templates for what could happen in Pool 2, above the dam at Hastings, under more favorable ambient water quality conditions. Backwater areas such as Baldwin Lake, River Lake, Spring Lake, Mooers Lake, and Grey Cloud Slough might be capable of higher ecosystem function than is now imagined. Lake Pepin also stands to benefit. As these systems improve, resuspension of sediment and phosphorus will decline, helping to achieve the 50% reduction in Pool 2 resuspension called for in the Lake Pepin eutrophication TMDL. However, achieving such results permanently likely will require simultaneous large reductions in sediment load from the Minnesota River.
- Minnesota River Basin Targeted Erosion Control: The prospect of a healthier Mississippi River from the metro area to Lake Pepin and on to the Iowa border justifies devoting state and federal resources to addressing near-channel sources of erosion in the Minnesota River basin, which remains the single greatest source of impairment. The fact that TSS loads from the Minnesota River have increased indicates that adoption of BMPs has not been sufficient to offset the effects of increased precipitation and stream flow, particularly on the erosion of streambanks, bluffs and ravines. These sources account for 60 to 85% of sediment delivery to streams in the Minnesota River basin (Belmont et al, 2011). The Sediment Reduction Strategy (MPCA, 2015) sets out targets for sediment load (25% reduction by 2020; 50% reduction by 2030) and stream flow (reduce the two-year annual peak flow by 25% by 2030). These targets are to be achieved through aggressive measures to control drainage and store water on the land, largely through local One Watershed/One Plan implementation.

However it is approached, the task of reducing near-channel erosion through drainage controls and surface runoff storage will be daunting and costly. While still pursuing these strategies, significant reductions in near-channel erosion might be pursued by other, somewhat simpler means. For example, implementation of practices which reduce ravine erosion at drainage tile outlets could be pursued. The integrity of stream buffers could be enhanced through needed maintenance and upland erosion control practices to prevent the formation of channels that can rupture the buffer strips. Erosion-prone areas next to streams and drainage ditches could also be identified and treated.

For greatest effectiveness, such efforts should be concentrated where they are likely to accomplish the greatest reductions. Priority major watersheds, and high sediment-producing areas within them, have been identified in previous studies. In particular, land areas near and downstream of nick points (abrupt increases in stream gradient) in tributaries are vulnerable to severe near-channel erosion. Within these priority areas, selected elements of One Watershed/ One Plan implementation projects could be accelerated with supplemental funding. Additional targeted measures should be funded as needed.

Information should be gathered to evaluate the status of conservation efforts and identify opportunities for targeting. Local units of government, with assistance from state agencies and the University of Minnesota, should use on-ground surveys or satellite imagery to:

- Measure the adoption of crop residue management, cover crops and the prevalence of surface intakes for tile drainage systems;
  - Identify breaches to the integrity of 50-foot stream buffers; and
  - Identify severely eroding ravines and primary causes of instability, including drainage tile outlets.
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- Layered Benefits: Although LPLA is focused on its priority issues of sediment and phosphorus pollution, solutions to these problems should be fashioned to produce additional benefits as opportunity affords. For example, wetland restoration and controlled drainage should be designed to denitrify as well as to retain surface runoff. Cropland BMPs for erosion control should be designed as a suite of practices to increase soil organic matter, and sequester carbon, as feasible. A focus on soil quality will tend to encompass the achievement of multiple benefits. Conservation easements can be planted to pollinator species. Similar opportunities for multiple benefits from urban stormwater management should also be pursued.
  
  - State Agency Assessment and Reporting: Federal and state governments responsible for monitoring the Mississippi River need to periodically assess whether water quality goals are being achieved. Toward that end, USGS monitoring of SAV in Navigation Pools 2 and 3, which provided data from 2006 to 2014, needs to be resumed, along with fish monitoring, to permit a thorough assessment of aquatic ecosystem health. Pollutant loading data from high-contributing watersheds in the Minnesota River basin need to be regularly published. Ideally, the state should gather all such data on a Great River data dashboard to allow stakeholders to check the current state of the resource and implementation efforts to improve and protect it. The Mississippi River deserves nothing less.
  
  - Civic Engagement: The Mississippi River is a national treasure. It is essential that interested stakeholders be informed about the status of its ecological health and be involved in developing plans for its restoration. A deliberate, ongoing program of outreach and civic engagement needs to accompany future monitoring, assessment, and restoration. Native American communities at Prairie Island, Shakopee, and the Upper and Lower Sioux Community reservations on the Minnesota River should be informed and engaged.

*\*Lake Pepin Legacy Alliance is a non-profit 501(c)3 organization with 1,300 members in Minnesota, Wisconsin and other states.*

## References

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## Appendix A: The Ask

### Strategic Coalition:

- Lake Pepin Legacy Alliance
- Friends of Pool 2 Mississippi River
- Lower Minnesota River Watershed District

### Objective 1: Mississippi River Monitoring, Assessment, and Reporting

Coalition Lead: Lake Pepin Legacy Alliance

Target Agencies: MPCA, BWSR, USGS, DNR

Request: Ongoing monitoring and assessment of the Mississippi River as outlined in the Evaluation Report.

### Objective 2: Minnesota River Basin Supplemental Funding

Coalition Lead: Lower Minnesota River Watershed District

Target Agencies: BWSR, NRCS

Request: Provide funding to supplement existing One Watershed/One Plan funding within priority area for stream channel erosion reduction, i.e., downstream of nick points in stream gradient. See Evaluation Report.

### Objective 3: Mississippi River Restoration

Coalition Lead: Friends of Pool 2

Target Agencies: USFWS, USACE, MDNR

Request: Evaluate potential for backwater ecosystem restoration.

### Objective 4: Civic Engagement Project Support:

Coalition Lead: LPLA

Target Agencies: MPCA, BWSR, MDNR

Request: Funding to support a two-year civic engagement process for stakeholders in the restoration of the South Metro Mississippi River and Minnesota River Basin.