



Environment and Natural Resources Trust Fund (ENRTF)

M.L. 2015 Work Plan

Date of Report: October 15, 2014

Date of Next Status Update Report: January 1, 2016

Date of Work Plan Approval:

Project Completion Date: June 30, 2016

Does this submission include an amendment request? No

PROJECT TITLE: Assessing Ecological Impact of St. Anthony Falls Lock Closure

Project Manager: Kathleen Boe

Organization: Minneapolis Riverfront Partnership

Mailing Address: 2522 Marshall St. NE

City/State/Zip Code: Minneapolis, MN 55447

Telephone Number: (612)746-4987

Email Address: kathleen.boe@minneapolisriverfrontpartnership.org

Web Address: www.minneapolisriverfrontpartnership.org

Location: Hennepin County

Total ENRTF Project Budget:

ENRTF Appropriation: \$125,000

Amount Spent: \$0

Balance: \$125,000

Legal Citation: M.L. 2015, Chp. 76, Sec. 2, Subd. 03p

Appropriation Language:

\$125,000 the first year is from the trust fund to the commissioner of natural resources for an agreement with the Minneapolis Riverfront Partnership to study the impact of altered river flow due to the closure of the Upper Lock on the Mississippi River at Saint Anthony Falls on the physical and biological characteristics of the river between the Coon Rapids Dam and Lock and Dam Number 1 in order to inform future river restoration efforts.

I. PROJECT TITLE: Assessing Ecological Impact of St. Anthony Falls Lock Closure

II. PROJECT STATEMENT: On June 10, 2014, the Water Resources Reform and Development Act (WRRDA) was signed into law. This law has broad impacts on inland waterway management throughout the United States. WRRDA includes a clause requiring that the Upper St. Anthony Lock be closed within a year from enactment of the law or June 10, 2015.

While extensive research exists on the potential economic impact of a lock closure (both in Minnesota and other parts of the country), little research is available on the environmental impact of a lock closure and associated changes to large river management. The Upper St. Anthony Lock closure is expected to alter both the hydrology and sediment dynamics of the Mississippi River. This project seeks to develop physical, chemical, and biological indicators that establish the current state of the Mississippi River and can be tracked over time as the river's ecosystem responds to major adjustments in management. Lessons learned from this project are expected to help develop a better understanding of the relationships between river management, hydrology, sediment dynamics and river ecology that can be applied to other river management scenarios. With the Upper St. Anthony Lock closure, we have an unparalleled opportunity to document the current state of the Mississippi River and to develop future river management approaches based on scientific investigations.

With the closure of the lock, commercial traffic, including barge traffic, will cease above the St. Anthony Falls Dam. The Army Corps of Engineers (USACE) is responsible for maintaining shipping lanes to a minimum depth of 9 feet in this area. Without commercial traffic, it will no longer be necessary to dredge the river to maintain this shipping channel. Dredging, by USACE, is expected to stop. USACE removes, on average, 43,000 cubic yards of sediment per year from the river or the equivalent of 200 semi-trailers of sand. Without dredging, a major question is how and where sediment will begin to accumulate, potentially changing river habitat both for aquatic organisms such as fish and mussels and/or altering the riparian corridor both above and below the falls.

This project will focus on the impact of the lock closure on the Mississippi River and the river corridor in the immediate area impacted by this closure, the area between Lock and Dam #1 (the Ford Parkway Bridge) and the Coon Rapids Dam. The study boundaries will be this area, the river and riparian corridor south of the Coon Rapids Dam to Lock and Dam #1.

Timing is critical: If baseline measurements are not established at the time of lock closure, this unique opportunity to track the river's physical, chemical, and biological response to a major change in management will be lost.

The long-term goal of this work is to examine what happens to the river over time as the river rebuilds itself without the impact of dredging. The objective of this project is to look at a broad set of measures – some that exist and some that we develop – to determine a targeted set of indicators that we can use to efficiently track changes in this complex river system. The river is a complex system. Tracking changes to this system could become a challenging, time consuming and expensive process. By choosing a set of indicators that represent expected change of other measures, the cost and complexity of studying this system over the years will be significantly reduced.

This is a two-phase project. Phase 1, proposed here, is to gather baseline data on how the river corridor functions and then to use this data to determine the optimal indicators to track changes in the river, both prior to the lock closure and afterwards. Phase 1 will establish this critical baseline and set the stage for efficient ongoing analysis of changes in the river corridor.

It is expected that with the completion of Phase 1, a Phase 2 project request will be submitted to LCCMR to track these indicators over a 3-5 year period. As described above, this second phase will be based on using a limited

set of indicators, as determined in Phase 1, to optimize the expense and complexity of the ongoing analysis. In addition to LCCMR funding for this additional phase, MRP and its partners are looking at other funding sources.

The project includes the following activities:

- Identify baseline measures of the river and riparian corridor condition, including both physical and biological metrics (e.g., flow data, mussel sampling, bathymetric measurements and land cover (MLCCS) data);
- Evaluate this data, involving a technical team with representatives from the Mississippi Watershed Management Organization, the St. Anthony Falls Laboratory and the Department of Natural Resources, including a biologist, an ecologist, and a hydrologist. The National Park Service, the Minnesota Pollution Control Agency, and the Army Corps of Engineers will also be resources;
- Establish criteria to select indicators to track these river changes over 3 to 5 years;
- Select key indicators to track changes in the river and the riparian corridor over 3 to 5 years; and
- Share the data with those interested in the ecology of the river and the riparian corridor.

III. OVERALL PROJECT STATUS UPDATES:

Project Status as of January 1, 2016:

Overall Project Outcomes and Results:

IV. PROJECT ACTIVITIES AND OUTCOMES:

Background

Timing of this work is critical. The lock is currently scheduled for closure no later than June 10, 2015. The Mississippi Watershed Management Organization (MWMO) is a partner in funding this project and has agreed to fund early stages of this project, including activity before LCCMR Funding could be made available in July 2015.

The project team has commenced with the first stages of the work identified in Activity 1. Bathymetric data was collected throughout the river in the City of Minneapolis in October and November of 2014.

The project team has begun a survey of available data. At this time, this includes data developed by the MWMO, the United States Geological Survey, the Minnesota DNR, the National Park Service, the Met Council and the US Army Corps of Engineers. Included in this survey is a determination of frequency and location of data collection. This survey will be used to determine what remaining data will need to be collected in the early spring and summer prior to the lock closure.

ACTIVITY 1: Baseline measurements

Description: Establish the current physical, chemical, and biological condition of the river corridor from the Coon Rapids Dam to Lock and Dam #1 near the Ford Parkway bridge. The goal of this first activity is to understand the current condition of the river at the time of lock closure.

The first step in this activity is to compile available physical, chemical, and biological data to develop an comprehensive picture of the current river conditions. Existing data sources, such as USACE, US Geological Survey (USGS), Metropolitan Council and the Minnesota Department of Natural Resources (MN DNR) will be mined.

After the identification of gaps in measurements, the project team will oversee the collection of additional data to support this project. Based on initial evaluation, it is assumed that the physical data collection will include an

analysis of the river depth and profile, flow, sediment and water chemistry characteristics. Biological measurements will include an analysis of mussel populations and fish populations in the study area.

To ensure that we have the most comprehensive understanding of the Mississippi River ecosystem prior to the lock closure, activity has started on this component of the project, prior to July 1, 2015, with support from the Mississippi Watershed Management Organization.

The outcome of this activity will be a report detailing all baseline data that has been collected with maps and monitoring sites identified.

Summary Budget Information for Activity 1:

ENRTF Budget: \$ 58,625
Amount Spent: \$ 0
Balance: \$ 58,625

Outcome	Completion Date
1. Complete analysis of existing data and collection of additional data, including river depth (bathymetry), flow, sediment, mussel population, fish populations.	October 2015
2. Report detailing baseline data collected. Include maps identifying monitoring sites.	December 2015

Activity Status as of January 1, 2016:

Final Report Summary:

ACTIVITY 2: Data evaluation and assessment

Description:

The goal of this activity is to develop and evaluate ecological indicators that can be tracked over time to develop an understanding of how the river and the riparian corridor react to large scale river management changes. Prioritization of these indicators is desirable to determine to ensure that ongoing monitoring of selected indicators is cost effective and therefore more likely to be completed.

To achieve this goal, the team will review and assess the data collected during Activity 1. This data will be critically evaluated to establish the strongest indicators of physical and biological changes in the river condition. The final set of indicators will be selected based on statistical validity, cost, and practicality of continuing with ongoing measurement. Once completed, a peer review will be conducted to validate the selected measurement system.

Summary Budget Information for Activity 2:

ENRTF Budget: \$ 41,325
Amount Spent: \$ 0
Balance: \$ 41,325

Outcome	Completion Date
1. Analyze data to determine prime indicators of impacts to the river and the riparian corridor.	March 2016
2. Complete report detailing the assessment of current baseline measurements and recommendations of river health indicators for future monitoring.	June 2016

Activity Status as of January 1, 2016:

Final Report Summary:

ACTIVITY 3: Engaging the community in the state of the river

Description:

The public in Minnesota is proud of its connection to clean and accessible lakes and rivers and proud of the fact that the headwaters of the Mississippi River are in the state. This highly publicized and historic lock closure provides a unique opportunity to connect the community with the urban river corridor and the management of rivers. Building community awareness, now, of how this resource is impacted by the closure will allow the community to track and understand changes seen in the river in the upcoming years as well as help to tell the story of the connection between river flow, sediment movement and river ecosystems. The Mississippi River is a world recognized resource and one that is critical to the life of lakes and streams in Minnesota. Through mapping tools and community engagement, we will ensure that those with a vested interest in ecological restoration have this information at their ready use.

Community engagement is an important part of this project because water challenges are increasingly in the news, both with the closing of the lock but also the changes to White Bear Lake. Getting information about the region's water systems to the public beyond specialists and advocates is a key part of this project. The public's awareness of water issues is great, but the specific knowledge is not yet at a par with interest and awareness. It is therefore vital to communicate what we are learning and what the indicators might tell us over the years ahead, with audiences not already well versed in the details of river science/natural processes. We'll reach out through local, neighborhood, and related groups.

Steps we plan to take to engage the community will include:

1. Develop maps showing existing conditions for ecological indicators and physical conditions such as river bed conditions.
2. Develop and present materials on the history of physical and ecological changes in the river, the impacts of lock closure on physical and ecological processes in the river system, and future analyses in light of the developed indicators.
3. All the material will be made available via web and social media in addition to neighborhood level groups adjacent to the river.

Summary Budget Information for Activity 3:

ENRTF Budget: \$ 25,050
Amount Spent: \$ 0
Balance: \$ 25,050

Outcome	Completion Date
1. Develop an interactive river map that makes data available to residents, planners, and scientists.	June 2016
2. Working with trained students, convey study results to interested audiences.	June 2016

Activity Status as of January 1, 2016:

Final Report Summary:

V. DISSEMINATION:

Description:

Some dissemination of information was discussed as part of Activity 3 above. In addition to that discussion, the material and results will be available through the Minneapolis Riverfront Partnership and the Mississippi Watershed Management Organization. The River Life program, through the University of Minnesota will also retain this data. The Minneapolis Riverfront Partnership maintains an active website for the Riverfront Vitality Project which publishes recent data and make that available for use (<http://minneapolisriverfrontpartnership.org/projects/riverfront-vitality-project/>).

This topic would also be offered as consideration for one of the several water forums that exist, including the Mississippi River Forum sponsored by the National Park Service.

Activity Status as of January 1, 2016:

Final Report Summary:

VI. PROJECT BUDGET SUMMARY:

A. ENRTF Budget Overview:

Budget Category	\$ Amount	Overview Explanation
Personnel:	\$ 23,760	Executive Director support is not funded. Program Management (18% time, 12 mo, covering all activities) Sr. Research Analyst: (15% time, 12 mo, supporting Activity 1,2)
Professional/Technical/Service Contracts:	\$ 93,430	- University of Minnesota: Jessica Kozarek : 15% time, Biologist: 15% time, 12 mo Hydrologist: 15% time, 12 mo University of Minnesota River Life Program Program Coordinator: Patrick Nunnally: 5% time, 12 mo, Digital Media Manager: 15% time, 12 mo, Student researchers (5, 6 months) - DNR: Mussel Survey (\$30,000, includes per diem, equipment, fleet, salary costs for sampling at 35 historic data sites and ~ 10 additional sites by two dive crews. This work will be secured by a fully executed MN Dept. of Administration Income Agreement).
Equipment/Tools/Supplies:	\$ 5,000	Lab supplies for suspended sediment analysis and flow analysis. This includes filters, sample containers, waders, and personal safety items (gloves, etc). Used in Activity 1
Printing:	\$ 2,000	Printing of report written for broad public consumption
Travel Expenses in MN:	\$ 810	Limited travel for researchers between sites
TOTAL ENRTF BUDGET:	\$125,000	

Number of Full-time Equivalentents (FTE) Directly Funded with this ENRTF Appropriation: 0.33 FTE

Number of Full-time Equivalentents (FTE) Estimated to Be Funded through Contracts with this ENRTF Appropriation: 0.65 FTE

B. Other Funds:

Source of Funds	\$ Amount Proposed	\$ Amount Spent	Use of Other Funds
Non-state			
Mississippi Watershed Management Organization	\$ 51, 526	\$	In Kind: Staff support for Activity 1 (data collection and analysis) and Activity 2 (data evaluation, indicator development and peer review), testing including sedimentation tests
State			
DNR	\$ 13,600	\$	In Kind: Program advising for Activity 1 and Activity 2
TOTAL OTHER FUNDS:	\$ 65,126	\$	

VII. PROJECT STRATEGY:

A. Project Partners:

Minneapolis Riverfront Partnership, Robert Spaulding (Sr. Research Analyst), Program Manager ENRTF funding of \$23,760

Mississippi Watershed Management Organization, Dr. Stephanie Johnson (Programs Principal), Dr. Udai Singh (Water Resources Manager), water flow, riverbed and river sediment analysis. – Support from MWMO includes In Kind contribution of \$51,526 and a matching grant of up to 25% of project cost with a maximum total of \$75,000.

University of Minnesota, St. Anthony Falls Laboratory, Dr. Jessica Kozarek eco-hydraulic engineer. Hydrologist and biologist to support work. Compilation of existing biological data for study reach (including fish, etc.), evaluation and development of habitat metrics as indicators of change due to river management, assistance with reporting. ENRTF funding of \$39,300

University of Minnesota, River Life Program, Patrick Nunnally and team – ENRTF funding of \$24,130

Minnesota Department of Natural Resources, Ecological & Water Resources Division, Mike Davis (Program Consultant), mussel populations; DNR Fisheries Division, fishery populations – ENRTF funding for Mussel Study, \$30,000 DNR Mussel Program does not have dedicated state funds to pay salaries and other costs. \$30,000 covers per diem, equipment, supplies, fleet and salary costs) In Kind contribution from DNR to project of \$13,600

B. Project Impact and Long-term Strategy:

This project represents a unique opportunity to study a river and its riparian corridor just before a known, significant change will be introduced into the physical system. To our knowledge, this is one of only a very few times that a lock has been ordered closed on a navigable river. The circumstance gives us an unparalleled opportunity to study how the Mississippi River works and to develop future river management approaches based on scientific investigations. Some questions that may be answered as a result of tracking changes to the river:

- What will be the impacts for fish habitat on the riverbed if there is a lot more sand and silt and less rock?
- With the end of commercial navigation and large tow boats and barges above the falls, what will the impact be on streambank erosion?
- If the lock opens only occasionally for emergencies, or not at all, what might be the impacts on fish migration? There are currently more diverse populations of mussels above the falls than there were before the lock opened in the 1960s, because the ability of fish to bypass the falls has meant that larval mussels transported by those fish could likewise move upstream. What are the impacts of that upstream movement being stopped?

These are just three of the numerous questions that scientific investigation of the river system at the point of lock closure can answer. Closing the lock does represent a major change in the management of the river. We have the opportunity to do systematic science to understand what additional steps will further enhance progress toward a healthy river.

As this work appears to be unique, the work can be applied broadly to other rivers in Minnesota and across the country.

The proposed project is Phase 1 of a two phase project. Phase 1 establishes this baseline; Phase 2 will track river changes over time. The Mississippi Watershed Management Organization has committed up to \$75,000 in matching funds. The Minneapolis Riverfront Partnership is in active discussions with other organizations about additional support for this project; however, those funds are not yet secured.

C. Funding History:

Funding Source and Use of Funds	Funding Timeframe	\$ Amount
Mississippi Watershed Management Organization – work on Activity 1 prior to July 1, 2015 – cash	October 1, 2014 to June 30, 2015	\$ 41,700
Mississippi Watershed Management Organization – work on Activity 1 prior to July 1, 2015 – In Kind	October 1, 2014 to June 30, 2015	\$ 45,542

VIII. FEE TITLE ACQUISITION/CONSERVATION EASEMENT/RESTORATION REQUIREMENTS:

A. Parcel List: N/A

B. Acquisition/Restoration Information: N/A

IX. VISUAL COMPONENT or MAP(S): MRP LCCMR Graphic 101514 .pdf

XI. REPORTING REQUIREMENTS:

A periodic work plan status update report will be submitted no later than January 1, 2016. A final report and associated products will be submitted between June 30 and August 15, 2016.



**Environment and Natural Resources Trust Fund
M.L. 2015 Project Budget**

Project Title: St. Anthony Falls Lock Closure: Assessing

Legal Citation: M.L. 2015, Chp. 76, Sec. 2, Subd. 03p

Project Manager: Kathleen Boe

Organization: Minneapolis Riverfront Partnership

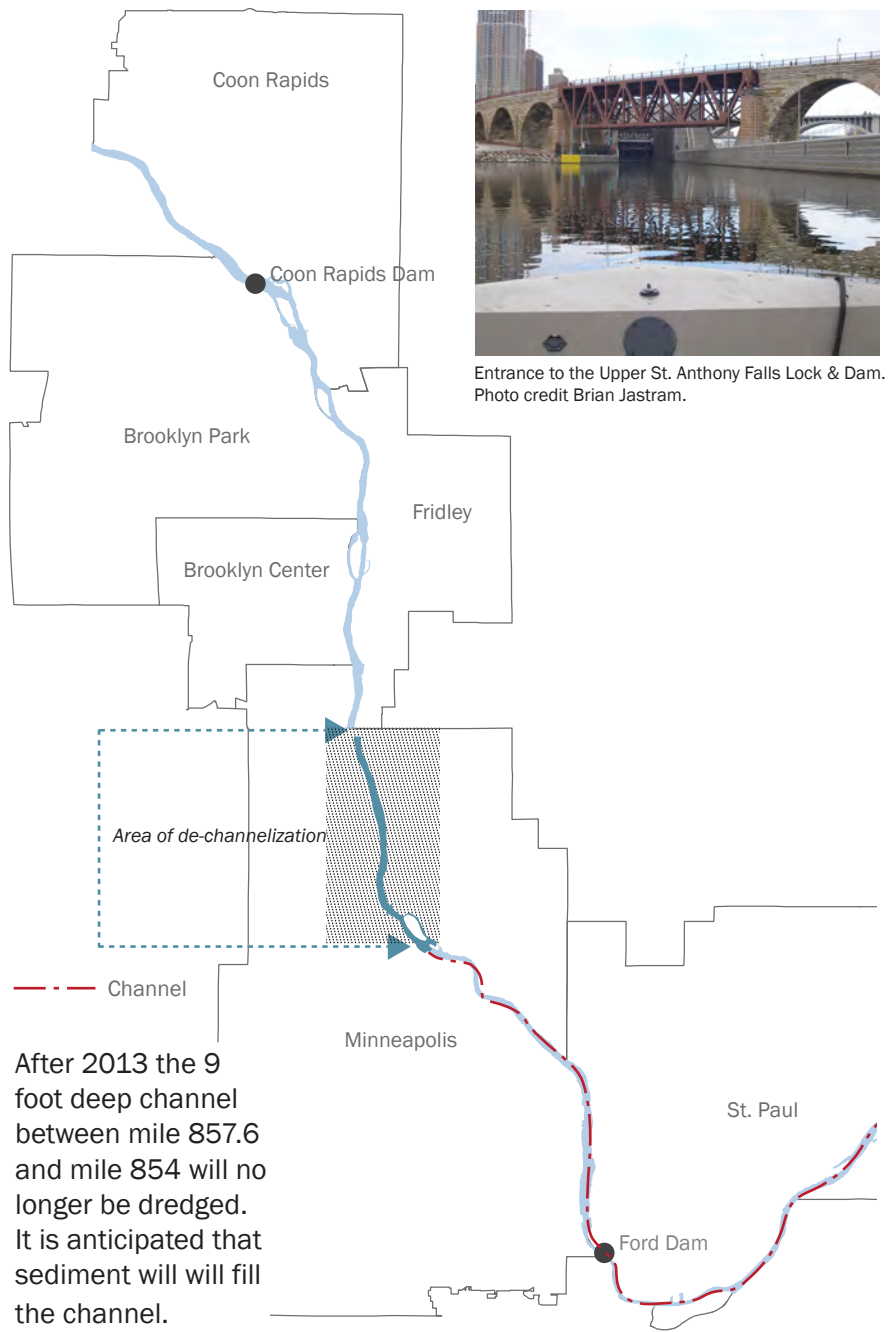
M.L. 2015 ENRTF Appropriation: \$ 125,000

Project Length and Completion Date: 1 year, June 30, 2016

Date of Report: 10/15/14

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET	Activity 1 Budget	Amount Spent	Activity 1 Balance	Activity 2 Budget	Amount Spent	Activity 2 Balance	Activity 3 Budget	Amount Spent	Activity 3 Balance	TOTAL BUDGET	TOTAL BALANCE
BUDGET ITEM	Baseline Measurements			Data Evaluation and Assessment			Engaging the Community in the State of the				
Personnel (Wages and Benefits)											
Program Manager: \$95,700(89% salary, 11% benefits); 18% FTE for one year	\$7,820	\$0	\$7,820	\$7,820	\$0	\$7,820	\$920	\$0	\$920	\$16,560	\$16,560
Bob Spaulding, Sr. Research Analyst: \$48,000 (89% salary, 11% benefits); 15% DTE for one year	\$2,400	\$0	\$2,400	\$4,800	\$0	\$4,800				\$7,200	\$7,200
Professional/Technical/Service Contracts											
University of Minnesota St. Anthony Falls Hydrology Lab: Compilation of existing biological data for study reach (including fish, etc.), evaluation and development of habitat metrics as indicators of change due to river management, assistance with reporting for Activities 1 and 2	\$13,000	\$0	\$13,000	\$26,300	\$0	\$26,300				\$39,300	\$39,300
University of Minnesota River Life Program: Material development and community engagement work for Activity 3							\$24,130	\$0	\$24,130	\$24,130	\$24,130
DNR:Mussel Survey (sampling species type, size, density and age at discrete points in the river) for Activity 1 , includes per diem, equipment, fleet, salary costs for sampling at 35 historic data sites and ~ 10 additional sites by two dive crews. This work will be secured by a fully executed MN Dept. of Administration Income Agreement).	\$30,000	\$0	\$30,000							\$30,000	\$30,000
Equipment/Tools/Supplies											
Activity 1 lab supplies for suspended sediment analysis and flow analysis. This includes filters, sample containers, waders, and personal safety items (gloves, etc)	\$5,000	\$0	\$5,000							\$5,000	\$5,000
Printing											
List types of printing costs anticipated.											
Report Publication (200 copies, full color, estimate 40 pages, spiral bound. Written for broad, public consumption)				\$2,000	\$0	\$2,000				\$2,000	\$2,000
Travel expenses in Minnesota											
Local travel only . Mileage for sample collection, meetings (12 mo, 2 trips/mo per research team, 20 miles per trip, \$0.56/mi) 1536 miles	\$405	\$0	\$405	\$405	\$0	\$405				\$810	\$810
COLUMN TOTAL	\$58,625	\$0	\$58,625	\$41,925	\$0	\$41,325	\$25,050	\$0	\$25,050	\$125,000	\$125,000

Closing the Lock and Dam: How will sedimentation change the river and surrounding habitat?



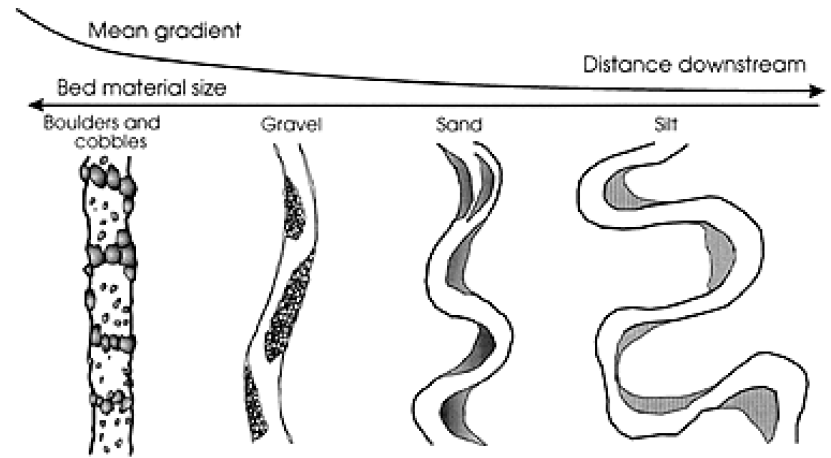
Entrance to the Upper St. Anthony Falls Lock & Dam. Photo credit Brian Jastram.

After 2013 the 9 foot deep channel between mile 857.6 and mile 854 will no longer be dredged. It is anticipated that sediment will fill the channel.

River morphology

Water quality

Riparian and River Habitat



The type of materials in a river bed shapes the morphology of the river.

Source: Adapted from Church, M. 1992. Channel Morphology and Typology. Chapter 6 in The River Handbook, vol. 1, P. Calow and G.E. Petts, eds. pp. 130, 136.



low turbidity



high turbidity



Photo credits: Turbidity) <http://mrbc.mnsu.edu/state-minnesota-river-2000-2005-surface-water-quality-monitoring> ; Mussels) <https://www.fws.gov/midwest/mussel/ecology.html> ; Waterfront) <http://www.nps.gov/stateoftheparks/MISS/>