

**Environment and Natural Resources Trust Fund
2017 Request for Proposals (RFP)**

Project Title:

ENRTF ID: 159-F

Mississippi River Gorge Restoration Planning and Assessment

Category: F. Methods to Protect, Restore, and Enhance Land, Water, and Habitat

Total Project Budget: \$ 130,000

Proposed Project Time Period for the Funding Requested: 2 years, July 2017 – June 2019

Summary:

Restoration of the Mississippi River Gorge would have great ecological and recreational benefits. With increasing opportunity for restoration, a feasibility assessment is needed to guide future restoration and management actions.

Name: Christian Lenhart

Sponsoring Organization: U of MN

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Location

Region: Metro

County Name: Dakota, Hennepin, Ramsey

City / Township: St. Paul

Alternate Text for Visual:

Images of the project area and historic Mississippi River Gorge are shown. Components of the restoration assessmetn are shown including a graph of the sediment deposit behind Ford Dam as well as fish species potentially effected by the restoration.

_____ Funding Priorities	_____ Multiple Benefits	_____ Outcomes	_____ Knowledge Base
_____ Extent of Impact	_____ Innovation	_____ Scientific/Tech Basis	_____ Urgency
_____ Capacity Readiness	_____ Leverage	_____ TOTAL	_____ %



Environment and Natural Resources Trust Fund (ENRTF)

2017 Main Proposal

Project Title: Mississippi River Gorge Restoration Planning & Assessment

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I. PROJECT STATEMENT

With the closure of Upper St Anthony Falls, and possibility of a new carp deterrent downstream, removal of the Ford Dam and restoration of the Mississippi River Gorge located between the Ford Dam and St. Anthony Falls in St. Paul and Minneapolis is increasingly possible in the near future. With the closure of the locks at St. Anthony the future of the other river dams in the Twin Cities are being reconsidered by public agencies and non-profit organizations. In other parts of the U.S. hydropower companies have traded their energy production at potential dam removal sites in order to gain more hydropower capacity elsewhere opening up the possibility for removing the Ford Dam. Gorge restoration would re-establish 5 miles of some of the most valuable fish and mussel habitat in North America. In addition an estimated three hundred acres of parkland would be re-established as islands and on river edges. However, this is big undertaking and much advanced work is needed. In particular, the feasibility of the restoration project needs to be examined more thoroughly to determine which ecosystem functions could be restored. While previous studies done by the University of Minnesota for the McKnight Foundation showed that many aspects of the former Gorge could be restored the specifics involving sediment transport, re-vegetation and fish passage were not investigated in detail. This study will assess the feasibility of restoring the Gorge both physically and ecologically.

The University of Minnesota in cooperation with American Rivers, local government units and non-profit organizations will assess the issues critical to restoration success. These include the potential impacts of dam removal on structures upstream, the potential gains in riverside parkland in St. Paul and Minneapolis and the impacts of dam removal on invasive carp movement. This study will provide a clear path forward for restoring the Mississippi River Gorge in future years. This project would benefit the Twin Cities metro area primarily, however future fish passage work could benefit southeastern Minnesota as part of an integrated effort to improve fish passage along the Mississippi River dams downstream to Winona, Minnesota.

II. PROJECT ACTIVITIES AND OUTCOMES

Activity 1: Physical and ecological assessment of Ford Dam removal

Budget: \$80,000

We will assess the critical hydrologic, hydraulic and geomorphic effects of the Ford dam removal that may limit its potential for restoration. First we will assess potential for toxic substances contained in reservoir sediment deposits by collecting 60 samples and analyzing them in the lab. Secondly we will assess potential downstream impacts in the 30 miles of river down to the Hastings Dam by investigating issues related to sediment release from the impoundment. Third, upstream impacts of water level and river bed elevation changes on upstream structures such as bridges and pipe outlets will be analyzed. These issues would include the need to lower storm sewer outfalls to a lowered river surface elevation.

Outcomes	Completion Dates
1.A. Identify extant and concentration of toxins in sediment deposits with 60 samples	<i>June 2019</i>
1.B. Identify areas sensitive to sediment transport downstream and define mussel habitat areas downstream of Ford Dam	<i>June 2018</i>
1.C. Assess potential effects of altered hydraulics and water levels on instream structures and side slopes using models	<i>June 2019</i>

Activity 2: Assess Ecological benefits of Mississippi River Gorge Restoration

Budget: \$50,000

Activity two will focus on assessing potential fish passage and mussel benefits by removing the Ford Dam for native species. Species that would benefit would be identified and potential future fish habitat areas would be determined for key species such as lake sturgeon. The hydraulics of the newly formed Gorge channel would be modeled to determine if river velocities and distances were sufficient to impede invasive carp movement



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upstream. Known freshwater mussel beds would be identified downstream of Ford Dam with Mike Davis from the Minnesota DNR.

Ecological assessment will include an enormous fish passage benefit assessment for native fish which historically used to spawn at the Upper St. Anthony Falls rapids. The potential for high-gradient rapids to serve as a carp blockage will be assessed by modeling hydraulic conditions in the proposed restoration reach. Potential future changes to riparian, floodplain and sandbar areas would be simulated using a combined hydraulic and vegetation model. An assessment of the potential for sandbar re-establishment which would allow for cottonwood establishment and public access on beach areas will be conducted. The area of potential land that could serve a new floodplain habitat and public access points will be determined as well. A GIS map would be provided to assist with planning of future park and open space improvements in the river corridor.

Outcomes	Completion Date
2.A. Assess the species and benefits of improved fish passage and mussel habitat	<i>June 2018</i>
2.B. Model velocity in high-gradient rapids within the Gorge to determine if the rapids would prevent Asian carp migration based on data from existing studies	<i>June 2019</i>
2.C. Delineate areas where riparian vegetation may be re-established using data and models	<i>June 2019</i>
2.D. Calculate the exact area re-established as floodplain and sandbar parkland in Gorge area	<i>June 2018</i>

III. PROJECT STRATEGY

A. Project Team/Partners

Dr. Chris Lenhart a grant-funded research professor at the University of Minnesota will lead the geomorphology, hydrology and riparian vegetation assessment. Dr. Peter Sorensen of the Fisheries Department will provide direction on the fish passage and carp issues. Funding would support a post-doctoral scientist or graduate student to work 25% for 2 years (\$50,000) to focus on modeling of the post-dam removal hydraulics and sediment movement. Dr. Lenhart would work 20% for two years (\$40,000) and Dr. Sorensen would work 2% time. Undergraduate labor support would be \$6,000 for two students in the summer to help collect sediment samples. Other non-funded partners will work on the project without drawing pay include: Olivia Dorothy of American Rivers will coordinate public outreach and partner collaboration. Dr. Bill Lazarus will conduct some preliminary economic analysis through work with his student. Dr. Jessica Kozarek from the St. Anthony Falls Lab (SAFL) will provide input on the study as well. Staff from the Friends of Mississippi River will provide input on community goals and interests. Mississippi River Management Organization will provide bathymetry (water depth) data. Staff from the Mississippi River Fund will assist on riparian vegetation studies.

B. Project Impact and Long-Term Strategy

Since the Ford Dam and upstream locks and dams are undergoing “disposition” studies by the U.S. Army Corps of Engineers it is very possible that the locks and dams in the Gorge will become obsolete in upcoming years. As the benefits of Gorge Restoration are made clear to the public and the potential issues are addressed the likelihood of restoring the Gorge will increase. With the findings from this study, American Rivers and other non-profit groups will be able to more successfully collaborate with government agencies and the hydropower company that utilizes Ford Dam currently. If successful, the Gorge restoration could begin within the decade. The project would provide benefit to millions of people over years and help to protect declining populations of numerous state and federally-listed threatened and endangered fish and mussel species.

C. Timeline Requirements

Upon receiving the grant funds in 2017 the physical and ecological components would be completed from 2017-2019. Field work would be done in the summer of 2017 and 2018. Report writing would be completed in 2019.

2017 Detailed Project Budget

Project Title: *Mississippi River Gorge Restoration Planning & Assessment*

IV. TOTAL ENRTF REQUEST BUDGET 2 years

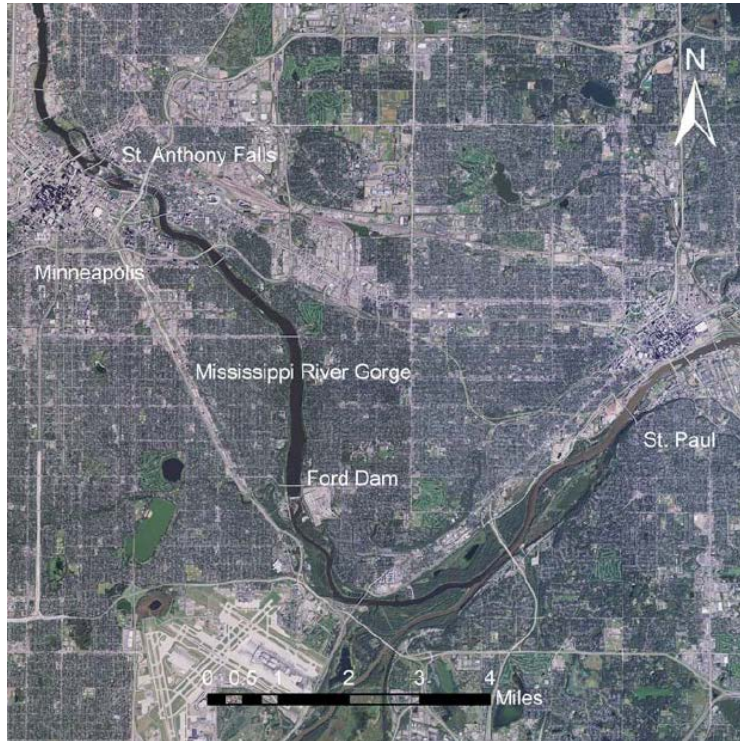
<u>BUDGET ITEM</u>	<u>AMOUNT</u>
Personnel: Post doctoral scientist, 25% FTE, salary and fringe, for 2 years	\$ 50,000
Chris Lenhart, Research professor, 20% FTE, salary and fringe, for 2 years	\$ 40,000
Dr. Peter Sorensen, Professor, 2% FTE, salary and fringe, for 2 years	\$ 7,000
Undergraduate workers, 12% FTE (summer only), for 2 years	\$ 6,000
Professional/Technical/Service Contracts: Sediment analysis for toxins, \$250 per sample for metals and PCBs x 60 samples = \$15,000	\$ 15,000
Equipment/Tools/Supplies: Sediment sampling equipment including augers and extensions to extract samples from reservoir sediments and lab supplies for storing, transporting and sorting sediment samples.	\$ 5,000
High-accuracy GPS for locating sediment sampling points and software for river modeling	\$ 4,000
Travel: field sampling trips to Mississippi River and travel to meetings with agencies and non-profit organizations including American Rivers	\$ 3,000
Additional Budget Items: none	\$ -
TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND \$ REQUEST	\$ 130,000

V. OTHER FUNDS

<u>SOURCE OF FUNDS</u>	<u>AMOUNT</u>	<u>Status</u>
Other Non-State \$ To Be Applied To Project During Project Period:	\$ -	N/A
Other State \$ To Be Applied To Project During Project Period: <i>no state funds are applied</i>	\$ -	N/A
In-kind Services To Be Applied To Project During Project Period: Donated (foregone) administrative costs by University of Minnesota \$69,550	\$ 69,550	<i>secured</i>
Funding History: McKnight Foundation, \$40,00 grant from 2010-2012 to review related Mississippi River restoration work and potential issues for restoring the Gorge	\$ 40,000	<i>completed</i>
Remaining \$ From Current ENRTF Appropriation: 0	\$ -	N/A

Mississippi River Gorge Restoration Planning & Assessment

Restoration of the River Gorge, a 5-mile river reach from St. Anthony Falls to the Ford Dam in the Twin Cities would have great ecological and recreational benefits (see below for project area).

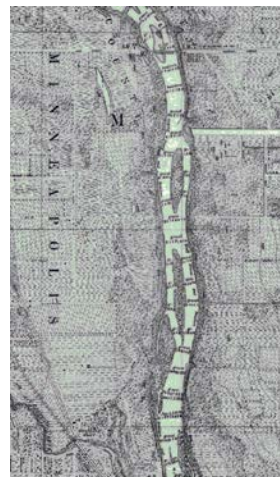


Removal or modification of the Ford Dam (below) would restore a unique 5-mile stretch of rapids on the Mississippi River.



1895 river

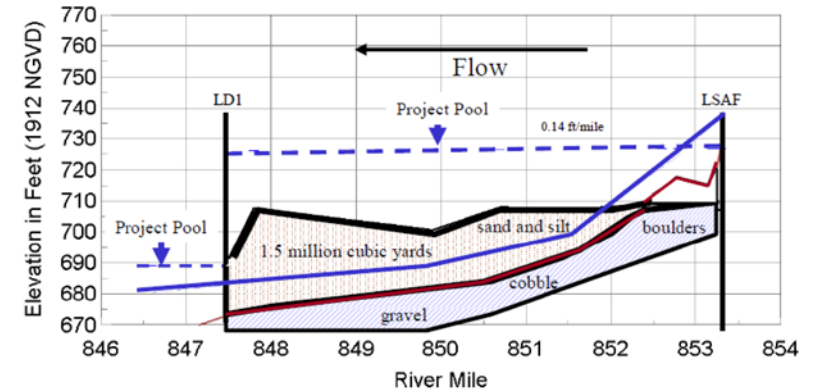
Present-day Gorge



Rapids, islands and riparian areas that are now submerged (above) could be restored. The exact area would be determined in this study.

05/07/2016

Physical assessment would include sampling of sediment deposits behind Ford Dam (below), and modeling changes to hydraulics and potential downstream and upstream sediment impacts to downstream river areas.



Assessment of fish passage and mussel benefits and problems would be analyzed with Mike Davis and Peter Sorensen. Lake sturgeon (lower left) would benefit by gaining access to spawning grounds. Carp would likely be blocked by five miles of rapids.



Lake sturgeon could migrate to spawning grounds



Asian carp may be blocked by fast-flowing rapids

ENR TF ID: 159-F

An 1850s painting of the Gorge shows historic boulders and rapids (right).



CHRISTIAN F. LENHART,

Research Assistant Professor, Ecological Engineering Group,
Department of BBE, University of Minnesota, St. Paul, MN

Education: Ph.D., Water Resources Science, University of Minnesota, 2008;
M.S. in Water Resources Management and MSLA in Landscape Architecture (restoration track),
University of Wisconsin-Madison, 2000;
B.S. in Biology, University of Notre Dame, 1993

Research and project management experience

Research Assistant Professor, 2010- present, University of Minnesota, BBE Department
Research project leadership: I have been the principal investigator or co P.I. on 10 research projects ranging from \$5,500 to \$312,000 since 2010. Some relevant projects that I've led or participated in include:

- Agricultural BMP Handbook update, a manual on the effectiveness of farmland management practices, Minnesota Dept. of Agriculture, 2015-16, \$65,000
- Minnesota River Basin Integrated Watershed, Water quality and Ecological Restoration Study. Assessment of ravine and stream bank erosion factors: hydrology, soil and plant interactions. U.S. Army Corps of Engineers, \$198,000 total (2013-2016)
- Assessing causes of accelerated erosion and restoration options in the Dakota Prairie Grasslands in the North Dakota Badlands region, U.S. Forest Service (2013-2015)
- Review of Mississippi River restoration and management work and Gorge restoration issues, (2010-2012), McKnight Foundation, \$40,000
- Developing approach for prioritizing stream restoration sites in the Minnesota River Basin for sediment reduction (2011-2013) (McKnight Foundation)(\$75,000)
- Researching tools for prioritizing channel restoration sites and investigating hydrologic drivers of channel erosion in different agro-ecoregions (2011-2015). MDA, \$280,000
- Led hydrologic monitoring and assessment to assess the impact of EAB-on forest hydrology in LCCMR study, Forecasting the hydrologic impacts of emerald ash borer on northern Minnesota black ash forests (2010-2014).

Teaching and Training: I have taught the following courses in the past 6 years: Ecological Engineering Design, Case Studies in Ecological Restoration, Watershed management, Global Water Sustainability, Sustainable Development in Ecuador, wetland ecology, plant ecology and soil science. Also I have conducted training courses on stream and wetland assessment.

Related Scientific Publications

- Lenhart, C. F., M. L. Titov, J. S. Ulrich, J. L. Nieber, and B. J. Suppes. 2013. The role of hydrologic alteration and riparian vegetation dynamics in channel evolution along the lower Minnesota River. *Transactions of the ASABE* 56(2): 549-561.
- Lenhart, C. F., J. Naber, and J. Nieber. 2013 Impacts of Hydrologic Change on Riverine Turtle Nesting Potential in Eastern Minnesota, USA. *Water* 5(3), 1243-1261; doi:10.3390/w5031243
- Lenhart C.F. 2012. Restoration of the Mississippi River Gorge in the Twin Cities: Assessing the Options. *Ecological Restoration* 30 (3): 218-227.

Organization Description – The BBE Department team strives for the sustainable use of renewable resources and enhancement of the environment. The Ecological Engineering group focuses on research and development of ecological management and restoration practices such as buffers, wetlands and drainage water management particularly in rural settings.