Environment and Natural Resources Trust Fund
2018 Request for Proposals (RFP)

Project Title: **ENRTF ID: 025-A**

Safeguarding Our St. Louis River Restoration Investment

Category: A. Foundational Natural Resource Data and Information

Total Project Budget: $ 378,949

Proposed Project Time Period for the Funding Requested: 3 years, July 2018 to June 2021

Summary:

Team will collect, analyze, and interpret new data using novel, highly structured method of interaction to better restore and manage fish and wildlife habitat in the St. Louis River.

Name: Ralph Garono

Sponsoring Organization: U of MN - Duluth NRRI

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Location

Region: Northeast

County Name: St. Louis

City / Township: Duluth

Alternate Text for Visual:

Image showing study area and planned bathymetry and land cover data examples. Results of this study will be used to: (1) evaluate the sensitivity of currently employed biotic indicators of ecological condition; (2) evaluate new "landscape" approaches to assess ecological restoration, and (3) develop action thresholds to assess and manage these areas well-beyond 2025.

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

PROJECT TITLE: Safeguarding Our St. Louis River Restoration Investment

I. PROJECT STATEMENT

The St. Louis River is the largest U.S. river flowing into Lake Superior. The 20mi^2 shallow complex of wetlands, nearshore and river habitat supports economically important fish and wildlife populations. Plagued by loss of critical habitat and water quality problems, this river was earmarked for an infusion of federal and state restoration funds in 1989. By 2025, an estimated $500M will have been spent to restore this valued Minnesota natural resource. For the most part, restoration has occurred on a project-by-project basis. Projects ranged from removal of contaminated sediments and invasive species control, to habitat creation. Our team has spent the past year speaking with state and federal agencies, tribes, and non-governmental organizations about the tools and techniques necessary to measure restoration success and, more importantly, how we can determine if future corrective actions need to be taken to prevent future habitat loss and environmental degradation. In short, how do we protect our capital investment and preserve this valued natural resource? Our discussions revealed that there are no widely accepted ways to determine if restoration actions are actually restoring critical habitats or result in better water quality. Therefore, we are proposing to work with agencies and interested parties during the next three years using a fairly novel, highly structured method called "Collaborative Modeling" to establish valid and agreed upon ways in which restoration success can be effectively assessed. This approach will build upon the lessons learned and extend them into new areas within the river-wetland complex. For example, underwater aquatic beds (fish habitat) have been mapped in a few areas several years ago. However, some of those maps have not been updated since the 2012 flood. As part of this project, we propose to collect new data, and process and interpret the data together with managers through the collaborative modeling process. Outcomes of this work include: (1) an updated inventory of important natural resources; (2) an agreed upon methodology to accurately assess restoration success; and (3) a streamlined and less expensive approach to systematically assess valued resources beyond 2025. This will ensure that restoration goals are being met and that the restoration 'trajectory' does not require large financial investments in the future. This project specifically addresses the following funding criteria: A-1, B-1, and adds value/ leverages ongoing work by MPCA, MN DNR and the MN Land Trust, and others.

II. PROJECT ACTIVITIES AND OUTCOMES

Activity 1: Embedding Our Science Team with Natural Resource Managers to Support Their Decisions **Budget: $113,685**

We will use a collaborative framework in a series of structured meetings and one-on-one interactions with restoration partners to identify restoration goals and to develop an understanding of the ecological linkages between natural resources / processes and these goals. This approach is transferable to restoration projects in other parts of Minnesota.

Outcome	Completion Date
1. Develop a series of defensible variables that are sensitive to restoration actions undertaken in the St. Louis River	Dec, 2019
2. Identify data-based management action thresholds to assess the restoration trajectory beyond 2025	Dec, 2020
3. Disseminate knowledge and data products to regional and outreach programs	Jun, 2021

Activity 2: Two-Year Field Assessment of Pre- and Post-Restoration Underwater Fish Habitat and Nearshore Vegetation **Budget: $265,264**

Field crews will produce a seamless spatial (geographic information system) data set describing nearshore land cover and underwater fish habitat using a novel, remote sensing approach. Maps of underwater fish habitat will include not only the presence of submerged aquatic vegetation (as it is currently assessed), but also the

arrangement of the vegetation on the bottom. This is important because some fish species use the edges of aquatic beds, while others use the interior areas. Information on fish habitat quality currently does not exist, although $100s of millions of dollars have been spent on restoring "fish habitat" in the St. Louis River. Our team will interpret results of this fieldwork (Activity 1) and help to design performance criteria for multiple completed and ongoing restoration projects.

Outcome	Completion Date
1. Field Assessment of Underwater Fish Habitat and Nearshore Vegetation	Oct, 2019
2. Analysis and Interpretation of Habitat Statistics	Dec, 2020
3. Develop recommendations for Restoration Design Criteria	Jun, 2021

III. PROJECT STRATEGY

A. Project Team/Partners

Project Team Receiving ENRTF Funding (UM-D/ NRRI): ***Dr. Ralph Garono****, PI, is responsible for overall project management; experienced in GIS, remote sensing and restoration assessment metrics/ indicators.* ***Dr. Katya Kovalenko****, Co-PI, is experienced in statistics and assessing habitat complexity.* ***Dr. Alice Yeates****, Co-PI, experienced in ecological modeling and vegetation sampling. Technician will work to help collect field data.* We have talked to Reschke et al. (Smart Mapping St. Louis River Estuary Habitats …) and agree that while our two LCCMR proposals deal with related topics, our approaches do not overlap and would compliment each other, if funded. Both proposals provide much needed information to managers. *Other Partners NOT Receiving ENRTF Funds:* **Dr. Shon Schooler** (The Federal Lake Superior Nation Estuarine Research Reserve) is currently researching aquatic habitat quality. MN Land Trust and MN DNR are currently developing habitat restoration and post-restoration plans.

B. Project Impact and Long-Term Strategy

This project will lead to a better return on funds already spent to restore critical freshwater fish and wildlife habitat, and to protect clean water. Current strategy involves removing contaminated sediments, creating habitat and taking measures to clean up degraded water. Unfortunately, we do not know if our past actions have led to improved fish habitat and water quality; nor do we have an early warning system to know when to implement future management actions to avoid the dramatic degradation already experienced by the St. Louis River. In short, restoration success criteria for all of this work have not been adequately defined. This is because we do not really have an area-wide data set with which to make comparisons. Our team will collect and analyze new data, in addition to data collected by others previously. Decision makers and managers will participate in the interpretation of the data and development of restoration success criteria. Once completed, aspects of this project can be repeated every 3 to 5 years at a much lower cost to track restoration success and preemptively address undesirable alterations to restoration trajectories. We expect components of this project to serve as a model for other habitat restoration efforts around Minnesota.

C. Timeline Requirements

Jul, 2018:	Project Begins
Jul, 2018 – Sep, 2020:	Structured (at least 5 - 2 to 3 day events) and Unstructured Interactions between Science Team and Natural Resource Management Groups, and data analysis/ interpretation
July – Oct, 2018:	Field Season I
Apr – Sep, 2019:	Field Season II
Jun, 2021:	End of Project

2018 Detailed Project Budget

Project Title: Safeguarding Our St. Louis River Restoration Investment

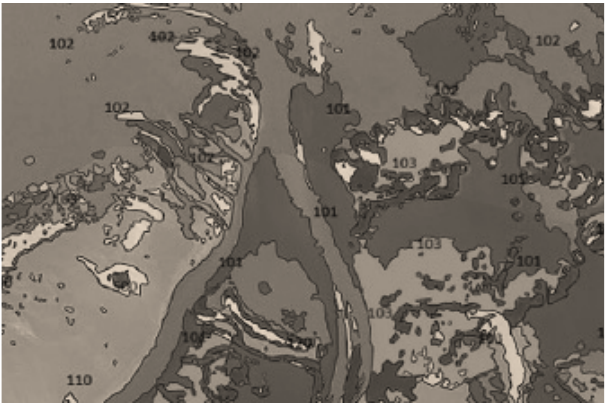
IV. TOTAL ENRTF REQUEST BUDGET: 3 years

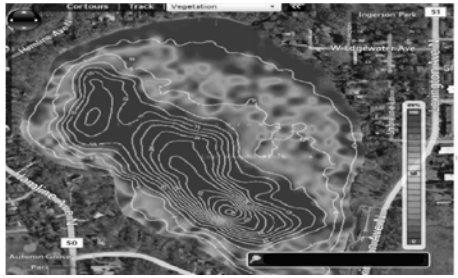
BUDGET ITEM	AMOUNT
PERSONNEL:	
Ralph Garono, Principal Investigator (66.5% salary, 33.5% benefits); 75% FTE yrs 1&2, 10% yr 3	$ 196,416
Katya Kovalenko, co-Investigator (66.5% salary, 33.5% benefits); 40% FTE yr 1, 25% yr 2, 10% yr 3	$ 63,489
Alice Yeates, co-Investigator (66.5% salary, 33.5% benefits); 25% FTE yrs 1&2, 3% yr 3	$ 44,615
Kristofer Johnson, GIS mapping (72.8% salary, 27.2% benefits); 10% FTE yrs 1&2	$ 16,437
Field technician, 72.8% salary, 27.2% benefits); 25% FTE yrs 1&2	$ 21,992
Supplies: Software for unsupervised classification of ~ 2m Ecosat imagery	$ 8,500
Supplies: 2-yr subscription to cloud-based processing for Sonar Data	$ 3,700
Supplies: EcoSound Sonar with 12" Display to plan and collect bathymetry and aquatic vegetation data	$ 2,500
Travel: mileage for PIs to stakeholder meetings, $100 per year for all 3 yrs	$ 300
Other: Shallow draft boat rental and fuel (60days @ $100 per day). Estimates are based on bids we received for recent proposals. We will follow University procedures to select a qualified collaborative modeling leader.	$ 6,000
Other: 20 days of facilitation for multi-partner meetings (20 days @$750 per day).	$ 15,000
TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND $ REQUEST =	$ 378,949

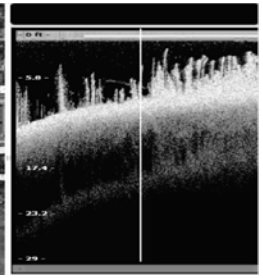
V. OTHER FUNDS

SOURCE OF FUNDS	AMOUNT	Status
Other Non-State $ To Be Applied To Project During Project Period:	N/A	
Other State $ To Be Applied To Project During Project Period:	N/A	
In-kind Services To Be Applied To Project During Project Period: Unrecovered indirect from UMD: 54% TDC	$ 204,633	Secured
Past and Current ENRTF Appropriation:	N/A	
Other Funding History:	N/A	

Safeguarding Our St. Louis River Restoration Investment







Data will be used to:

(1) evaluate the sensitivity of currently employed biotic indicators of ecological condition;

(2) evaluate new "landscape" approaches to assess ecological restoration, and

(3) develop action thresholds to assess and manage these areas well-beyond 2025.

Bathymetry and bottom hardness GIS layer

Land Cover GIS Layer

We plan to build GIS layers to describe land cover within entire outlined study area

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Project Manager Qualifications & Organization Description

Dr. Ralph Garono, PI, a Research Associate at the University of Minnesota Duluth, Natural Resources Research Institute, specializes in biochemical limnology, aquatic entomology, botany, and GIS-based assessments/ models of watersheds and nearshore coastal areas. He headed up a 10 yr study that used hyperspectral imagery to characterize the intertidal habitat of juvenile Chum salmon in western Puget Sound (Can. J. Remote Sensing 30(1): 54-63 and DOI: 10.13140/RG.2.1.1043.7200). Dr. Garono recently coordinated a NOAA-funded project team composed of researchers from MN DNR, NRRI, and The Nature Conservancy that evaluated several climate scenarios on the flow patterns within Lake Superior North Shore tributaries. Dr. Garono he has over 25 years experience and is currently measuring wintertime patterns of dissolved oxygen concentration and winter algal assemblages in the lower St. Louis River.

Dr. Katya Kovalenko, a Research Associate at the University of Minnesota Duluth, Natural Resources Research Institute, specializes in biomonitoring, habitat complexity, food web structure, aquatic invasive species, and functional changes in response to anthropogenic stressors as well as ecological statistics. Dr. Kovalenko edited Special Issues on Habitat Complexity and AIS and published highly cited reviews on these topics (Kovalenko et al. 2012, Havel et al. 2015). She has 11 years of experience with macroinvertebrate and macrophyte sampling, identification and data analyses, focusing in particular on the Great Lakes coastal wetlands.

Dr. Alice Yeates a Research Associate at the University of Minnesota Duluth, Natural Resources Research Institute, specializes in wetland ecology, invasive plant ecology, coastal marsh dynamics, field research, ecological response to anthropogenic disturbance, as well as ecological modeling and statistics. Dr Yeates has 17 years of experience with ecological surveys, field and glasshouse experiments, data management and analysis and has conducted much of this research in the St Louis River Estuary during the last 5 years. She has published a number of peer-reviewed publications, which utilize her unique skill set (Yeates et al. 2012, Laidlaw et al. 2015).

The Natural Resources Research Institute (NRRI) is a part of the University of Minnesota Duluth. Staff are experienced at assessing organism assemblages from a variety of aquatic habitats, evaluating aquatic habitat conditions, and establishing biological indicators for fish, amphibian, macroinvertebrate, diatom and periphytic communities. Equipment includes a variety of high quality research-grade compound and stereomicroscopes, some with digital imaging capabilities for training, archiving images, and estimating sample biomass. NRRI field sampling equipment includes a fleet of five open water sampling vessels and two shallow water, flat bottom water craft; a variety of invertebrate, water sampling and benthic coring devices; water quality instrumentation units (e.g., Hydrolab Sondes, YSI multi-probes, etc.); shallow-water electrofishing equipment; passive fish collection equipment (Fyke trap nets, purse and standard seine nets).