

**Environment and Natural Resources Trust Fund
2019 Request for Proposals (RFP)**

Project Title:

ENRTF ID: 020-A

Data Visualization Tool for Minnesota Riverbed Habitat

Category: A. Foundational Natural Resource Data and Information

Sub-Category:

Total Project Budget: \$ 509,231

Proposed Project Time Period for the Funding Requested: June 30, 2022 (3 yrs)

Summary:

The data visualization tool is an interactive web map that displays distribution and diversity of riverbed habitat helping resource managers better understand underwater features critical to effective management and -restoration.

Name: Nancy Duncan

Sponsoring Organization: National Park Service

Title: Natural Resource Program Manager

Department: _____

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St. Paul MN 55101

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Location

Region: Metro

County Name: Anoka, Chisago, Dakota, Hennepin, Ramsey, Washington

City / Township:

Alternate Text for Visual:

Interpreted sonar data and visual imagery are compiled into a data visualization tool for decision support. The interactive web map is designed to let users explore Minnesota riverbed habitat features.

_____ Funding Priorities	_____ Multiple Benefits	_____ Outcomes	_____ Knowledge Base
_____ Extent of Impact	_____ Innovation	_____ Scientific/Tech Basis	_____ Urgency
_____ Capacity	_____ Readiness	_____ Leverage	_____ TOTAL _____%
_____ If under \$200,000, waive presentation?			



Environment and Natural Resources Trust Fund (ENRTF) 2019 Main Proposal Template

PROJECT TITLE: Data Visualization Tool for Minnesota Riverbed Habitat

I. PROJECT STATEMENT

The riverbed habitat data visualization tool will be a publicly-available interactive map that will provide detailed information on the distribution and diversity of underwater habitat features for portions of two Minnesota rivers. Studying a river from its surface reveals little information about underwater features and dynamics. Spatial characteristics of riverbed features such as bed morphology (bed form can determine the strength and direction of currents) and sediment type (bedrock, rock, gravel, sand, etc.) can help managers make more informed decisions about where to place propagated native mussels during restoration efforts. Maps of the riverbed are developed from hydroacoustic (sonar) remote sensing information to understand the river's biological dynamics in geographic context. Combined data layers can reveal where features coincide, suggesting relationships that drive the distribution and abundance of aquatic organisms.

The data visualization tool will provide information on underwater habitat features for two large Minnesota Rivers: Mississippi and St. Croix. Essentially, this is a GIS visualization tool (similar to Google Earth format) for aquatic data. Visual data will include imagery and interpreted habitat features. Maps of the river bottom may be comprised of multiple components, focused primarily around sediment type. Other components can be riverbed morphology (form), vegetation and woody debris, man-made structures, rugosity (measure of complexity), slope, induration (bottom hardness) and water column characteristics (turbidity, DO, pH, etc.). These datasets compiled into an interactive online data visualization tool are designed to let a wide variety of users – local, state, and federal agencies, academia, and the general public explore riverbed habitat.

Maps of the river bottom have important implications for habitat management, assessing change (human or environmental), predicting sediment deposition, recreational resources (fish habitat and navigation), and support for municipal development decisions. Habitat management is the most widely known use for this tool. For example, survival of native mussels can depend on physical habitat characteristics, such as substrate stability. Integration of hydroacoustic information combined with spatial riverbed characteristics would assist managers in evaluating substrate stability for potential mussel propagation and relocation sites.

The U.S. National Park Service partnered with the U.S. Geological Survey Upper Midwest Environmental Sciences Center, to collect hydroacoustic (multibeam and side scan sonar) data during 2018-2019 for the development of high-resolution bathymetry (water depth) and sonar images that can be used as model inputs for mussel habitat projects. In addition, the U.S. National Park Service has funded a small pilot benthic (river bottom) mapping project. The Mississippi National River and Recreation Area and the St. Croix National Scenic Riverway want to build on these projects by further developing the hydroacoustic information into underwater inventories. Developing these inventories into a data visualization tool will help to better understand riverbed habitat diversity for resource management.

II. PROJECT ACTIVITIES AND OUTCOMES

Activity 1: Map and quantify riverbed features in the lower 30 miles of St. Croix National Scenic Riverway and Mississippi National River and Recreation Area from LCCMR funded hydroacoustic datasets.

To identify habitat features of the riverbed, GIS and specialized software will be used to map interpreted and calculated data that make up the GIS framework. Activities and outcomes will focus on: 1) develop a submersed aquatic vegetation classification, 2) apply the U.S. Army Corps' of Engineers Upper Mississippi River Restoration geomorphology classification, 3) interpret previously collected hydroacoustic data (multibeam bathymetry and backscatter data), and 4) use the U.S. Army Corps' of Engineers mussel survey



Environment and Natural Resources Trust Fund (ENRTF)
2019 Main Proposal Template

data to validate substrate. We will also complete an accuracy assessment to determine accuracy of substrate and submersed vegetation datasets.

ENRTF BUDGET: \$485,477

Outcome	Completion Date
1. Develop classification(s) for data layers	Oct. 31, 2019
2. Map riverbed data layers: morphology, substrate, submersed vegetation communities and woody debris, man-made structures, slope, and rugosity.	Sept. 30, 2021
3. Complete Accuracy Assessment (field work and data analysis) for both rivers.	Dec. 31, 2021

Activity 2: Design and develop online data visualization tool

Design and develop an online data visualization tool - a fully interactive web GIS application designed to let users display habitat features of the riverbed (developed from Activity 1). A comprehensive collection of data will be viewable by simply selecting datasets the user wishes to view. All previously funded and current project data will be compiled into a GIS framework viewable online.

ENRTF BUDGET: \$23,754

Outcome	Completion Date
1. Web design of the Data Visualization Tool for Minnesota Riverbed Habitat	June 30, 2022

III. PROJECT PARTNERS:

A. Partners receiving ENRTF funding

Name	Title	Affiliation	Role
Jenny Hanson	Biologist	USGS	USGS Lead
James Drake	Ecologist	NPS (contractor)	Vegetation Classification

B. Partners NOT receiving ENRTF funding

Name	Title	Affiliation	Role
Byron Karns	Acting Chief of Resource Management	NPS	SCNSR Park Lead

IV. LONG-TERM- IMPLEMENTATION AND FUNDING: The data visualization tool will be accessible via the world wide web for multiple aquatic applications. The ability to view combined, or overlapping datasets for a specific area can provide the following benefits: 1) guide mussel conservation efforts, 2) assess ecosystem threats or damage from invasive species, or in the event of an oil spill, 3) establish guidelines to detect future changes in habitat, geomorphology, and sediment transport, measure success or failure of habitat restoration efforts, and 4) guide eradication efforts of aquatic invasive species. The USGS will host the data for two years after the project is complete, but then will turn the data and web services over to the State of Minnesota.

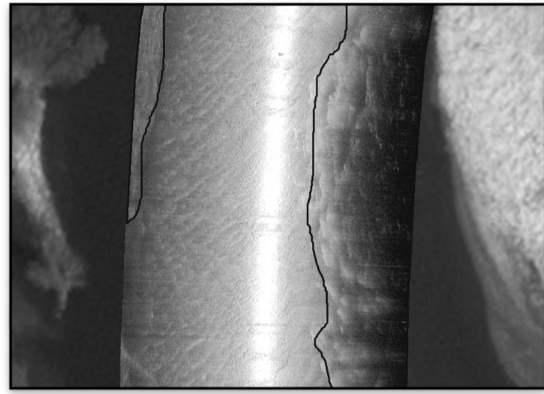
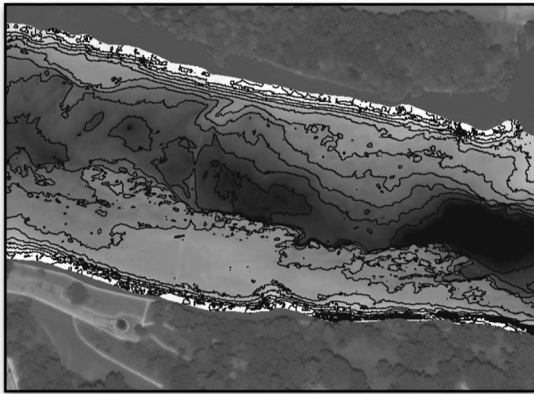
V. TIME LINE REQUIREMENTS: The complete development for the suite of products (with corresponding metadata) compiled into a user friendly web-based data visualization tool will be delivered over a three-year project timeline.

Project Title: Data Visualization Tool for Minnesota Riverbed Habitat**IV. TOTAL ENRTF REQUEST BUDGET 3 years**

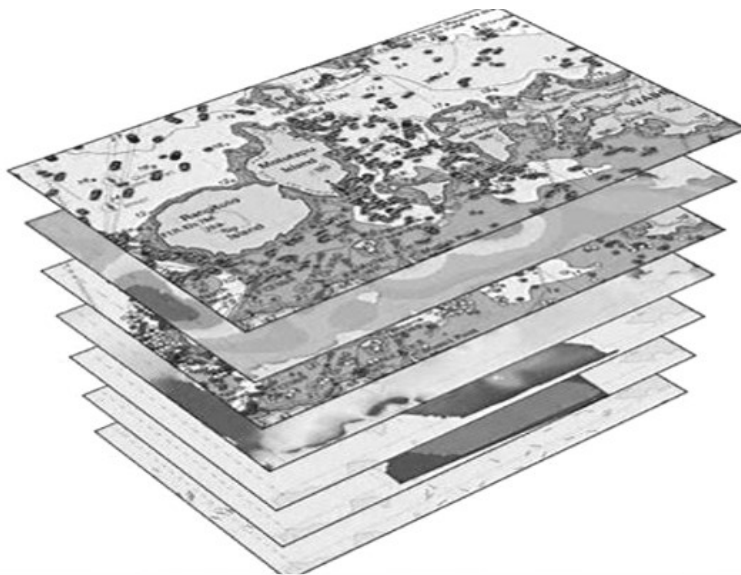
BUDGET ITEM	AMOUNT
Personnel:	\$ -
NPS Project Management: (80% salary; 20% benefits; 15.4% FTE/FY19; 15.4% FTE FY20)	\$ 33,117
NPS Support: (80% salary; 20% benefits; 7.7% FTE/FY19; 7.7% FTE/FY20)	\$ 19,842
Aquatic Biologist: (80% salary; 20% benefits; 19.2% FTE/FY19; 23.1% FTE/FY20)	\$ 33,557
Professional/Technical/Service Contracts:	
US Geological Survey: Development of online Data Visualization Tool for Minnesota Riverbed Habitat	\$ 411,435
Aquatic Plant Ecologist: Develop submersed aquatic vegetation classification	\$ 11,280
Equipment/Tools/Supplies:	
Travel:	\$ -
Additional Budget Items:	\$ -
TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND \$ REQUEST =	\$ 509,231

V. OTHER FUNDS (This entire section must be filled out. Do not delete rows. Indicate "N/A" if row is not applicable.)

SOURCE OF FUNDS	AMOUNT	Status
Other Non-State \$ To Be Applied To Project During Project Period:		
U.S. Army Corps of Engineers Upper Mississippi River Restoration Hydrogeomorphic Classification and Mapping	\$ 36,000	<i>pending</i>
Other State \$ To Be Applied To Project During Project Period:	n/a	
In-kind Services To Be Applied To Project During Project Period:		
National Park Service In-kind Support: agency boat survey equipment; boat and vehicle gas for Classification and Accuracy Assessment field work	\$ 12,500	<i>Secured</i>
US Geological Survey In-kind Support: agency equipment including, software, equipment for AA, and Science Support.	\$ 121,502	<i>Secured</i>
Past and Current ENRTF Appropriation:		
FY18 LCCMR funding for multibeam and side scan sonar collection, processing, and development of hydroacoustic products	\$ 200,000	<i>pending</i>
Other Funding History:		
U.S. Army Corps of Engineers Monitoring of Native Mussel Higgins Eye (<i>Lampsilis higginsii</i>) Essential Habitat Areas at Hidden Falls, MN, 2015	\$ 15,000	<i>Secured</i>
U.S. Army Corps of Engineers Monitoring of Native Mussel Habitat Areas in the Mississippi National River and Recreation Area Corridor Sites	\$ 15,000	<i>Secured</i>
U.S. Army Corps of Engineers Monitoring of Native Mussel Habitat Areas in Lower Pool 2	\$ 20,000	<i>Secured</i>
NPS St. Croix Folsom Island Benthic Mapping Pilot Project	\$ 15,000	<i>secured</i>



Step 1: Interpret previously collected hydroacoustic data into GIS layers



Riverbed morphology

Submersed vegetation

Substrate

Man-made structures

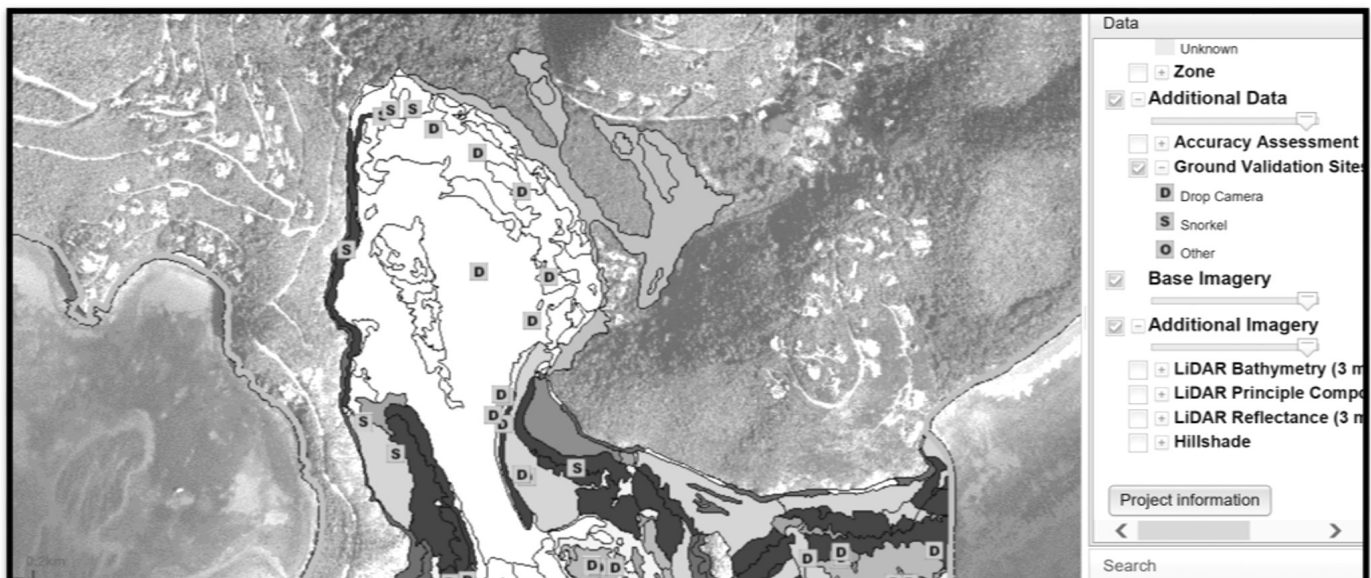
Validation images

Bathymetry

Side scan image

River currents

Step 2: Develop Data Visualization Tool for Minnesota Riverbed Habitat



Example map: NOAA National Centers for Coastal Ocean Science

Project Manager Qualifications

Project Manager: Nancy Duncan, Natural Resource Program Manager, Mississippi National River and Recreation Area

Affiliation: National Park Service

Mailing Address: 111 E. Kellogg Blvd; Suite 105, St. Paul, MN 55101

Telephone: 651-293-8434

Email: nancy_duncan@nps.gov

Nancy Duncan has been Natural Resource Program Manager with the National Park Service, Mississippi National River and Recreation Area (MNRRA) for over 20 years. She coordinates corridor research within the MNRRA, reviews projects, writes and administers grants, sits on numerous Technical Advisory Committees, hires and supervises summer seasonal biological technicians, approves research permits, facilitates natural resource project coordination between the 26 communities within the corridor, and does occasional planning work. Current efforts include developing an overarching natural resource management plan for the entire 72-mile stretch of the MNRRA and the lower 4 miles of the Minnesota River that fall within the MNRRA boundary.

Work Experience:

1992 – present Natural Resource Program Manager, National Park Service, MISS

1987 – 1992 Cartographic Technician (GIS), National Park Service, Denver Service Center

Education:

1985 – 1992 PhD Candidate, Forest Ecology/Soils Minor, University of MN

1984 – M.S. Degree – Forest Resources, University of MN

1980 B.S. Horticulture/Landscape Architecture, University of Missouri – Columbia

Project Manager Responsibilities:

As the Project Manager, Nancy will provide overall project direction, project reporting, budget management, supervision of field efforts, and provide review prior to dissemination of all data products. As the Natural Resource Program Manager, Nancy has demonstrated her ability to manage budgets, direct staff, coordinate with partners, and efficiently and effectively deliver project outcomes.

Organization Description:

The Mission of the National Park Service, which celebrated its 100th Anniversary in 2016, is “to preserve unimpaired the natural and cultural resources and values of the National Park System for the enjoyment, education, and inspiration of this and future generations.” The Mississippi National River and Recreation Area was established in 1988 to preserve the history and natural resources of the Mississippi River as it runs through the Minneapolis/St. Paul area, particularly the river itself and the migratory flyway. The National Park Service also has a strong mission to promote the use of the National Parks as natural laboratories to better understand the natural world.