Environment and Natural Resources Trust Fund
2020 Request for Proposals (RFP)

Project Title: ENRTF ID: 021-A

Complete Sonar Data Mapping on Three Minnesota Rivers

Category: A. Foundational Natural Resource Data and Information

Sub-Category:

Total Project Budget: $ 525,945

Proposed Project Time Period for the Funding Requested: June 30, 2023 (3 yrs)

Summary:

Acoustic data are compiled into an interactive web map that displays distribution and diversity of underwater habitat helping resource managers better understand underwater features critical to effective management and conservation.

Name: Nancy   Duncan

Sponsoring Organization: National Park Service

Job Title: Natural Resource Program Manager

Department:

Address: 111 E. Kellogg Blvd; Suite 105

St. Paul   MN   55101

Telephone Number: (651) 293-8434

Email nancy_duncan@nps.gov

Web Address: https://www.nps.gov/miss/index.htm

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	_____%

PROJECT TITLE: Complete Sonar Data Mapping on Three Minnesota Rivers

I. PROJECT STATEMENT

The National Park Service and U.S. Geological Survey Upper Midwest Environmental Sciences Center would like to continue building on "phase 1" of the project "Develop Sonar Data Mapping on Three Rivers to Assess Suitability for Native Mussel Habitat" to complete detailed maps of underwater habitat features. Habitat layers (developed from acoustic data) can be combined to understand the river's biological dynamics in geographic context. The ability to view combined, or overlapping datasets for a specific area can provide the following benefits:

- guide removal efforts of aquatic invasive species
- assess ecosystem threats or damage
- guide mussel conservation efforts
- measure success or failure of habitat restoration efforts
- help understand distribution of aquatic species in Minnesota
- establish guidelines to detect changes in habitat, geomorphology, and sediment transport

We are requesting funding for "Phase 2" to further develop sonar (acoustic) data into map products that will be combined into an online interactive web map (similar to Google Earth format) that will allow local, state, federal agencies, academia, and recreational boaters (i.e. general public) to explore riverbed habitat for their needs.

Currently, underwater acoustic data was collected on the lower 48 kilometers of the St. Croix river during the summer of 2018, and is being processed into bathymetry (water depth), underwater image mosaics, and shaded relief images. This summer, the project will continue with the Upper Mississippi River (M.L 2018, Chp. 214, Art. 4, Sec. 2, Subd. 03j). However, more information can be derived from these acoustic datasets, such as substrate type (sand, gravel, rock), riverbed morphology (bed forms), submersed vegetation beds, woody debris, and man-made structures. Additionally, bed complexity, slope, hardness, and water column characteristics can be derived. Combining these data layers can reveal where features coincide, suggesting relationships that drive the distribution and abundance of aquatic organisms. This project would be valuable to past and current ENRTF projects (see attachment) that have research in these aquatic areas by providing previously unknown underwater habitat information. For example, survival of native mussels can depend on physical habitat characteristics, such as substrate stability and river current. Acoustic information combined with spatial underwater habitat characteristics would assist managers in evaluating substrate stability for potential mussel propagation and relocation sites.

The following is an extensive list of existing information needs for resource management:

- Identify preferred aquatic invasive species habitat
- Evaluate underwater habitat damage
- Monitor sediment dynamics of large rivers
- Identify Threatened & Endangered species preferred habitat
- Emergency Response (oil spills)
- Island erosion monitoring
- Flood assessment

To effectively address these issues, a comprehensive understanding of the type, geographic extent, and condition of underwater resources is needed. For example, species of Asian Carp prefer different habitats. Silver Carp prefer deep water habitat, but spawn in shallow river tributaries. Grass carp prefer habitat resources that include submersed vegetation. Zebra mussels prefer hard surfaces, like cobbles, boulders, and native mussels, but will reside on submersed vegetation stalks too. Knowing locations of preferred habitat can help with control and removal efforts. Completion of "phase 2" will provide resource managers needed information to develop strategies for large river resource management.

II. PROJECT ACTIVITIES AND OUTCOMES

1

Activity 1: Map and quantify underwater habitat features from previously acquired acoustic data

To date, acoustic data has been collected for the lower St. Croix River to develop bathymetry and imagery products, and will continue through 2020 for the Mississippi River (M.L. 2018, Chp. 214, Art. 4, Sec. 2, Subd. 03j). To identify underwater habitat features, GIS and specialized software will be used to map acoustic data. Activity 1 will focus on data mining for existing water quality and river velocity parameters; collecting underwater video (to assess map accuracy); develop supporting acoustic data layers (i.e. slope, roughness, hardness); and develop habitat layers (i.e. sediment, bed morphology, etc.).

ENRTF BUDGET: $452,336

Outcome	Completion Date
1. Field collection of underwater videos; Data mining for existing data	Oct 31, 2021
2. Develop data layers derived from acoustic data & complete Accuracy Assessment	June 30, 2023

Activity 2: Design and develop online web map for users

A web developer will design a user-friendly web-based habitat map (similar in format to Google Earth) to be a fully interactive web GIS application. The map will be designed to let users display underwater habitat features (developed from Activity 1). All previously funded and current project data will be compiled into a GIS framework viewable online. This tool will help support resource management decisions.

ENRTF BUDGET: $73,609

Outcome	Completion Date
1. Web design of the Minnesota Three Rivers Habitat Mapper	June 30, 2023

III. PROJECT PARTNERS:

A. Partners receiving ENRTF funding

Name	Title	Affiliation	Role
Nancy Duncan	Natural Resource Program Manager	NPS	Project Manager
Jenny Hanson	Biologist	USGS	USGS Lead

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 Minnesota Three Rivers Habitat Mapper (St. Croix, Mississippi, and Minnesota Rivers) will be available to users as an interactive online web map which will include links to download the data to be applied to user's project, or the user will be able to print or export a map. 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 map will be delivered over a three-year project timeline.

2

Attachment A: Project Budget Spreadsheet
Environment and Natural Resources Trust Fund
M.L. 2020 Budget Spreadsheet
Legal Citation:
Project Manager: Nancy Duncan
Project Title: Sonar Data Mapping of Three Rivers Continuation
**Organization:** National Park Service
Project Budget: $525,945
Project Length and Completion Date: 3 years
Today's Date: 4/15/2019

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET	Budget	Amount Spent	Balance
BUDGET ITEM			
Personnel (Wages and Benefits)		$ -	$ -
National Park Service Biology Technician 1: Data mining, field surveys and video interpretation for Accuracy Assessment, final report writing. (80% salary; 20% benefits; 3.8% FTE/FY20; 27% FTE FY21; 34.6% FTE FY22)	$ 36,124		$ 36,124
National Park Service Biology Technician 2: Data mining, field surveys and video interpretation for Accuracy Assessment (80% salary; 20% benefits; 3.8% FTE/FY20; 27% FTE FY21; 30.7% FTE FY22)	$ 27,426		$ 27,426
Professional/Technical/Service Contracts			
US Geological Survey Upper Midwest Environmental Sciences Center: Development of Minnesota Three Rivers Habitat Map (single source for nature of work and quality standards)	$ 461,895	$ -	$ 461,895
Equipment/Tools/Supplies			
Field survey boat and vehicle fuel	$ 500	$ -	$ 500
COLUMN TOTAL	$ 525,945	$ -	$ 525,945

SOURCE AND USE OF OTHER FUNDS CONTRIBUTED TO THE PROJECT	Status (secured or pending)	Budget	Spent	Balance
Non-State:		$ -	$ -	$ -
U.S. Army Corps of Engineers Upper Mississippi River Restoration Conceptual Model and Hierarchical Classification of Hydrogeomorphic Settings in the Upper Mississippi River System	secured	$ 120,000	$ -	$ 120,000
U.S. Army Corps of Engineers Long Term Monitoring of Native Mussel Species at the Prescott Higgins Eye (*Lampsilis higginsii*) Essential Habitat Area, St. Croix River, 2017	secured	$ 15,000	$ 15,000	$ -
U.S. Army Corps of Engineers Monitoring of Freshwater Mussel Communities of the St. Croix River near Hudson and Interstate Parks, Minnesota and Wisconsin	secured	$ 15,000	$ 15,000	$ -
NPS St. Croix Folsom Island Benthic Mapping Pilot Project	secured	$ 15,000	$ 15,000	$ -
USGS SSP Transformation methods for the glochidia of the spectaclecase mussel Cumberlandia monodonta	secured	$ 138,323	$ 138,323	$ -
NPS NRPP Improving survival of juvenile winged mapleleaf through identification of host fish over-wintering areas	secured	$ 230,755	$ 230,755	$ -
State:				
In kind:		$ -	$ -	$ -
National Park Service In-kind Support: agency boat survey equipment and agency Management Support	secured	78,720	$ -	$ 78,720
US Geological Survey In-kind Support: agency equipment including software and underwater video camera; Management & Science Support.	secured	94,025	$ -	$ 94,025

Other ENRTF APPROPRIATIONS AWARDED IN THE LAST SIX YEARS	Amount legally obligated but not yet spent	Budget	Spent	Balance
M.L. 2018, Chp. 214, Art. 4, Sec. 02, Subd. 03j "Develop Sonar data Mapping on Three Rivers to Assess Suitability for Native Mussel Habitat"	$ 200,000	$ 200,000	$ 25,768	$ 174,232

USGS
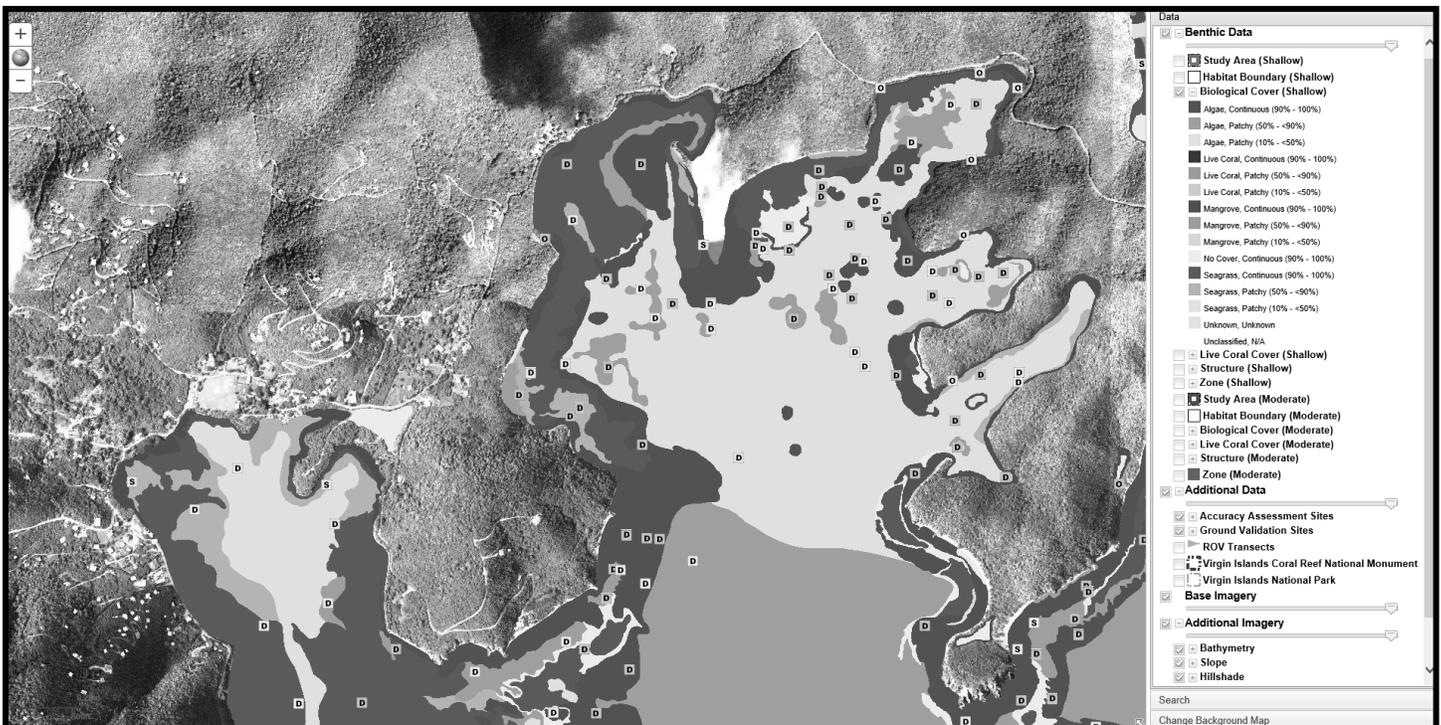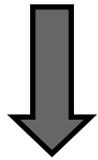science for a changing world

NATIONAL PARK SERVICE
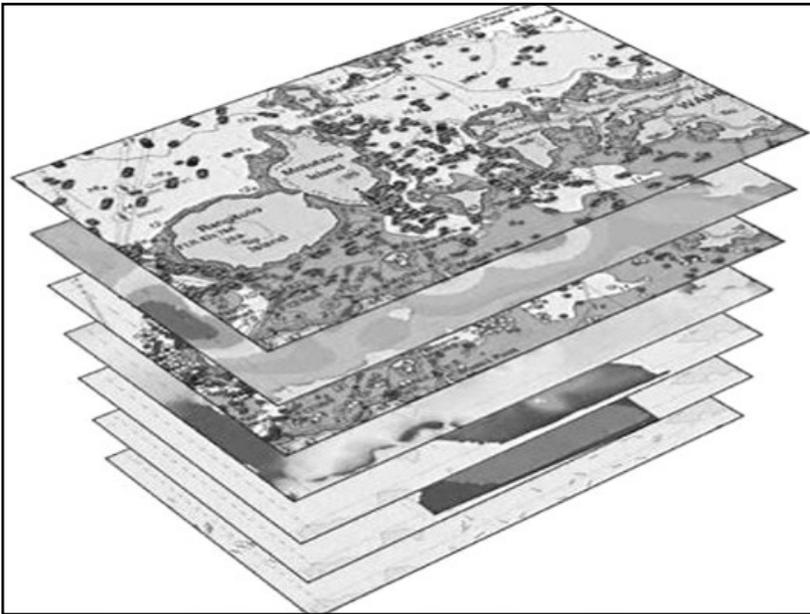
Map products (GIS layers)
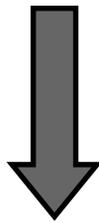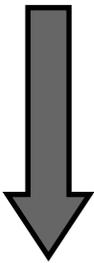
Map Products

⇒ Bathymetry (*water depth*)

⇒ Shaded Relief Images

⇒ River Current Velocities

⇒ Sonar Image Mosaics

⇒ Substrate Type

(*sand, mud, gravel, etc.*)

⇒ Man-made & Bed Form Features

⇒ Submersed Aquatic Vegeta-tion

⇒ Woody Debris

⇒ Slope

Example Web Map: NOAA National Centers for Coastal Ocean Science BIOMapper

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.