



Environment and Natural Resources Trust Fund (ENRTF)

M.L. 2018 ENRTF Work Plan (Main Document)

Today's Date: February 19, 2018

Date of Next Status Update Report:

Date of Work Plan Approval: 06/05/2018

Project Completion Date: June 30, 2020

Does this submission include an amendment request? no

PROJECT TITLE: Develop Sonar Data Mapping on Three Rivers to Assess Suitability for Native Mussel Habitat

Project Manager: Nancy Duncan

Organization: National Park Service Mississippi National River and Recreation Area

College/Department/Division:

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

Location: Anoka, Chisago, Dakota, Hennepin, Ramsey, Washington

Total Project Budget: \$200,000

Amount Spent: \$0

Balance: \$200,000

Legal Citation: M.L. 2018, Chp. 214, Art. 4, Sec. 02, Subd. 03j

Appropriation Language: \$200,000 the second year is from the trust fund to the commissioner of natural resources for an agreement with the National Park Service to create high-resolution sonar data maps to identify critical native mussel habitat for the designated Lower St. Croix National Scenic Riverway and the Mississippi National River and Recreation Area including part of the Minnesota River.

I. PROJECT STATEMENT:

The Mississippi National River and Recreation Area and the St. Croix National Scenic Riverway have established high-value habitat corridors for native freshwater mussels, including the Higgins' eye, *Lampsilis higginsii* and winged mapleleaf, *Quadrula fragosa* which are 2 of 28 species listed as either extirpated, endangered, threatened, or of special concern in Minnesota. Understanding what constitutes mussel habitat is vitally important for identifying suitable habitat for the conservation and restoration of freshwater mussels in Minnesota. Mussel habitat has not been well quantified partly due to the lack of information on benthic conditions in turbid, complex riverine systems. Benthos is the community of organisms that live on, in, or near the bottom of water bodies, also known as the benthic zone. The primary goal for this project is to collect high-resolution sonar information of benthic characteristics which may be used to identify native mussel habitat corridors. This project builds on past Minnesota mussel surveys, and will provide information useful to future survey efforts.

Sonar is a remote sensing technology used to map benthic environments. High-resolution sonar datasets provide baseline information, or building blocks that are necessary for understanding important spatial ecological relationships regarding how and why certain habitat corridors supply habitat for freshwater mussels. Recent advances in hydroacoustic technologies can provide information useful for developing key physical and hydrological variables needed to model mussel habitat. Mapping these variables will provide resource managers information to more accurately assess environmental factors that influence mussel distributions. The development of these spatial decision tools provides viewing of modeled datasets in a digital environment to interpret mussel habitat to better understand the complex benthic habitat corridors where freshwater mussels reside. The tools developed from the acquired sonar datasets could provide relevant information useful to other Minnesota rivers supporting native freshwater mussels.

While the direct purpose of these datasets and tools will be used for modeling mussel habitat, potential applications for these data are numerous for other natural resource agencies, academia, non-profit organizations, and policy makers in Minnesota. The information derived from high-resolution sonar is necessary for aquatic habitat assessments, habitat improvement projects, and quantifying submersed aquatic plant volume. Currently, hydroacoustic data is being utilized in fisheries research for mapping Asian carp habitat and preferred sturgeon spawning habitat. In addition to aquatic invasive species, other emerging issues hydroacoustic data can be applied to include channel sedimentation work such as channel formation and migration, island erosion, sand dune migration, and sediment load estimates.

The National Park Service, with the U.S. Geological Survey will acquire high-resolution hydroacoustic data, where no current data exists, to develop high-grade bathymetry and imagery. The term bathymetry refers to water depth relative to sea level, and bathymetry maps illustrate the land that lies under water. Additionally, acoustic Doppler current profilers measuring river current velocities will be collected in high priority areas, a necessary component needed to model physical and hydraulic variables in relation to native mussel habitat. The combined datasets will provide key components to interpreting benthic conditions and characterizing native mussel habitat. This will provide resource managers information to more accurately assess environmental factors that influence mussel distributions. The newly acquired sonar datasets will be beneficial to other natural resource agencies in Minnesota, using the information as tools for the conservation and effective management of habitats for these ecologically important animals.

II. OVERALL PROJECT STATUS UPDATES:

First Update January 31, 2019

Second Update June 30, 2019

Third Update January 31, 2020

III. PROJECT ACTIVITIES AND OUTCOMES:

ACTIVITY 1:

Description: St. Croix National Scenic Riverway sonar survey, data processing, interpretation & modeling, and development of map products.

The U.S. Geological Survey Upper Midwest Environmental Sciences Center will acquire high-resolution sonar data of the lower 48 kilometers of the St. Croix River. Hydroacoustic surveys will be done according to U.S. Geological Survey standards during the summer of 2018. The study area for the lower St. Croix River includes the area from the shoreline to depths up to 7.5 meters, an accumulated area of approximately 1620 hectares. Once collected the sonar data requires processing for various locational variables and development into products using geographic information systems.

Predetermined high priority areas will have an additional mapping effort, which consists of acoustic Doppler current profiles measuring river current velocities, and substrate interpretation. Substrate sampling will be conducted during sonar data collection. While actual mussel habitat likely consists of a suite of physical, chemical, and biological traits, by combining the river current velocities with bathymetry and substrate type, physical inputs for modeling mussel habitat can be developed.

Validation efforts (diving) for mussel beds and substrate type, will be provided courtesy of the National Park Service. These datasets will provide additional accuracy assessment for mussel habitat inputs, like substrate type, a necessary component of modeling mussel habitat.

Product outcomes will consist of high-resolution bathymetry, digital elevation models, and underwater digital terrain models (relief) for the study area. Priority areas will have additional products consisting of sonar imagery, acoustic Doppler current profiles, substrate maps, and mussel habitat model inputs. All data will be developed according to U.S. Geological Survey and Federal Geographic Data Committee standards. Once review and dissemination are complete, products will be posted online for shared use with additional stakeholders. Presentations and/or publications of this project will be carried out.

ENRTF BUDGET: \$86,170

Outcome	Completion Date
1. Hydroacoustic surveys completed for the lower St. Croix River.	October 31, 2018
2. High-resolution bathymetry, digital elevation models, digital terrain models, and sonar image mosaics developed.	June 30, 2019
3. Mussel substrate maps, and mussel habitat inputs developed.	October 31, 2019
4. Presentations and/or publications of project.	June 30, 2020

First Update January 31, 2019

Second Update June 30, 2019

Third Update January 31, 2020

Final Update Between June 3 and August 15, 2020

ACTIVITY 2:

Description: Mississippi National River and Recreation Area sonar survey, data processing, interpretation & modeling, and development of map products.

The U.S. Geological Survey Upper Midwest Environmental Sciences Center will acquire high-resolution sonar data of the Mississippi National River and Recreation Area where no current bathymetry exists. Hydroacoustics will be surveyed according to US Geological Survey standards during the spring of 2019. The study area excludes areas of bathymetry already collected by the U.S. Army Corps of Engineers. Instead of duplicating those areas, the U.S. Army Corps of Engineers’ data will be integrated with the new bathymetry. Post collection, the sonar data requires processing for locational variables, and development into products using geographic information systems.

Predetermined high priority areas will have additional hydroacoustic and mapping efforts consisting of acoustic Doppler current profiles measuring river current velocities, and substrate interpretation. Substrate sampling will be conducted during sonar data collection. While actual mussel habitat likely consists of a suite of physical, chemical, and biological traits, by combining the river current velocities with bathymetry and substrate type, physical inputs for mussel habitat models can be developed.

Validation efforts (diving) for mussel beds and substrate, will be provided courtesy of the National Park Service. Substrate sampling will be conducted during sonar data collection. These datasets will provide additional accuracy assessment for mussel habitat inputs, like substrate type, a necessary component of modeling mussel habitat.

Product outcomes will consist of high-resolution bathymetry, digital elevation models, and underwater digital terrain models for newly acquired multibeam data combined with the U.S. Army Corps of Engineers’ bathymetry data. For areas of high priority, the derivatives will include sonar imagery, river current profiles, substrate maps, and mussel habitat model inputs. All data will be developed according to U.S. Geological Survey and Federal Geographic Data Committee standards. Once data review and dissemination are complete, data will be posted online. Presentations and/or publications will be carried out.

ENRTF BUDGET: \$113,830

Outcome	Completion Date
1. Hydroacoustic surveys completed for the Mississippi National River and Recreation Area.	June 30, 2019
2. High-resolution bathymetry, digital elevation models, digital terrain models, and sonar image mosaics developed.	December 31, 2019
3. Mussel substrate maps, and mussel habitat inputs developed.	June 30, 2020
4. Presentations and/or publications of project.	June 30, 2020

First Update January 31, 2019

Second Update June 30, 2019

Third Update January 31, 2020

Final Update Between June 3 and August 15, 2020

ACTIVITY 3:

Description: Freshwater Riverine Benthic Map Pilot Study

The U.S. Geological Survey Upper Midwest Environmental Sciences Center, with the National Park Service, will collaborate with an ecologist (NatureServe) and the National Oceanic and Atmospheric Administration for a pilot study developing a benthic map of a small, high priority area within the St. Croix National Scenic Riverway. Hydroacoustics will be surveyed according to US Geological Survey standards. Additionally, substrate and vegetation sampling will also occur. All agencies will collaborate to inventory and map the biotic (plants and animals) and abiotic (water depth, pH, turbidity, nutrients, dissolved oxygen) riverine features and elements of the pilot study area according to the Servicewide Benthic Mapping Program.

Validation efforts (diving) for mussel beds and substrate type, will be provided courtesy of the National Park Service. These datasets will provide additional accuracy assessment for all benthic habitat map components.

Product outcomes will consist of a digital benthic map classified according to the Coastal and Marine Ecological Classification Standard. This freshwater river benthic map will be applicable to future benthic mapping efforts for both the Mississippi National River and Recreation Area and the St. Croix National Scenic Riverway. The digital map products will be developed according to U.S. Geological Survey, National Park Service, and Federal Geographic Data Committee standards. Once review and dissemination of digital data are complete, the dataset will be posted online for shared use. Presentations and/or publications of this pilot study will be carried out.

ENRTF BUDGET: \$ 0 (National Park Service in-kind \$14,500)

Outcome	Completion Date
1. Field efforts (sonar collection, sampling, diving) completed.	September 30, 2018
2. Riverine Benthic Map (pilot study) developed.	June 30, 2020
3. Presentations and/or publications of pilot study.	June 30, 2020

First Update January 31, 2019

Second Update June 30, 2019

Third Update January 31, 2020

Final Update Between June 3 and August 15, 2020

IV. DISSEMINATION:

Description: Prior to dissemination, all products will be thoroughly reviewed following protocols by each organization. Nancy Duncan (Mississippi National River and Recreation Area) and Byron Karns (St. Croix National Scenic Riverway) will provide in-kind data reviews. All data and metadata will undergo formal U.S. Geological Survey data review. Once the reviewed datasets are disseminated, the data will be published on the following website: <https://www.sciencebase.gov>. The U.S. Geological Survey will maintain, store, and host the data for the public to download.

Any presentations, publications, or final reports developed from the project will be reviewed and disseminated according to each organizations' protocols. Raw data will be available upon request.

First Update January 31, 2019

Second Update June 30, 2019

Third Update January 31, 2020

Final Update Between June 3 and August 15, 2020

V. PROJECT BUDGET SUMMARY:

A. Preliminary ENRTF Budget Overview: See attached budget spreadsheet

Explanation of Capital Expenditures Greater Than \$5,000: NA

Explanation of Use of Classified Staff: NA

Total Number of Full-time Equivalents (FTE) Directly Funded with this ENRTF Appropriation:

Enter Total Estimated Personnel Hours: N/A	Divide by 2,080 = TOTAL FTE: N/A
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Total Number of Full-time Equivalents (FTE) Estimated to Be Funded through Contracts with this ENRTF Appropriation: 1.38

Year 1:

Enter Total Estimated Personnel Hours: 560	Divide by 2,080 = TOTAL FTE: 27%
Enter Total Estimated Personnel Hours: 560	Divide by 2,080 = TOTAL FTE: 27%
Enter Total Estimated Personnel Hours: 40	Divide by 2,080 = TOTAL FTE: 2%
Enter Total Estimated Personnel Hours: 80	Divide by 2,080 = TOTAL FTE: 4%

Year 2:

Enter Total Estimated Personnel Hours: 760	Divide by 2,080 = TOTAL FTE: 36.5%
Enter Total Estimated Personnel Hours: 760	Divide by 2,080 = TOTAL FTE: 36.5%
Enter Total Estimated Personnel Hours: 40	Divide by 2,080 = TOTAL FTE: 2%
Enter Total Estimated Personnel Hours: 80	Divide by 2,080 = TOTAL FTE: 4%

B. Other Funds:

SOURCE OF AND USE OF OTHER FUNDS	Amount Proposed	Amount Spent	Status and Timeframe
Other Non-State \$ To Be Applied To Project During Project Period:			
National Park Service St. Croix National Scenic Riverway - Interagency agreement to fund Activity 3 to develop the Benthic Mapping Pilot Study	\$ 14,500	\$ 0	Pending March 1, 2018 – September 30, 2018
National Park Service Mississippi National River and Recreation Area - In-kind Project management and Data review efforts and funds relating to project.	\$9,403	\$0	Secured July 1, 2018 – June 30, 2020
National Park Service St. Croix National Scenic Riverway & National Park Service Mississippi National River and Recreation Area - In-kind validation efforts and funds relating to project efforts.	\$21,412	\$0	Secured July 1, 2018 – June 30, 2020
US Geological Survey Upper Midwest Environmental Sciences Center - In-kind support for equipment and software maintenance for data collection, and center indirect costs.	\$189,912		Secured July 1, 2018 – June 30, 2019

Other State \$ To Be Applied To Project During Project Period:			
none	\$	\$	
Past and Current ENRTF Appropriation:			
none	\$	\$	
Other Funding History:			
none	\$	\$	

VI. PROJECT PARTNERS:

A. Partners receiving ENRTF funding

Name	Title	Affiliation	Role
Jenny Hanson	Biologist	US Geological Survey Upper Midwest Environmental Sciences Center	USGS Contract Lead

B. Partners NOT receiving ENRTF funding

Name	Title	Affiliation	Role
Nancy Duncan	Natural Resource Program Manager	National Park Service Mississippi National River and Recreation Area	Project Manager
Byron Karns	Aquatic Biologist	National Park Service St. Croix National Scenic Riverway	Diver/Validation Lead

VII. LONG-TERM- IMPLEMENTATION AND FUNDING:

The outcomes or products from this project can be used by resource managers for habitat applications including protecting and conserving imperiled native mussels, understanding invasive species establishment, sedimentation, and many other uses. The available datasets can be applied by other agencies interested in assessing physical and hydraulic variables that correlate with the distribution and abundance of imperiled freshwater mussels, and other priority native and invasive species. For the Mississippi National River and Recreation Area and the St. Croix National Scenic Riverway, these datasets are the foundation for pursuing additional funding to further develop the hydroacoustic products from this project into benthic habitat maps using the Servicewide Benthic Mapping Program protocols for National Park Service. Benthic habitat maps are important as they provide ecological information that supports management and protection of submerged National Park natural and cultural resources. Expansion of this project does not have funding secured, but the National Park Service and U.S. Geological Survey intend to apply to funding opportunities, utilizing existing partnerships and inter-agency efforts to broaden the development of this important tool needed for protecting, conserving, reintroducing, and managing dwindling freshwater mussel populations.

VIII. REPORTING REQUIREMENTS:

- The project is for 2 years, will begin on July 1, 2018, and end on June 30, 2020.
- Periodic project status update reports will be submitted January 31 and June 30 of each year.
- A final report and associated products will be submitted between June 30 and August 15, 2020.

IX. SEE ADDITIONAL WORK PLAN COMPONENTS:

- A. Budget Spreadsheet**
- B. Visual Component or Map**
- C. Parcel List Spreadsheet - NA**
- D. Acquisition, Easements, and Restoration Requirements - NA**
- E. Research Addendum - NA**

**Attachment A:
Environment and Natural Resources Trust Fund
M.L. 2018 Budget Spreadsheet**

Project Title: Develop Sonar Data Mapping on Three Rivers to Assess Suitability for Native Mussel Habitat

Legal Citation: M.L. 2018, Chp. 214, Art. 4, Sec. 02, Subd. 03j

Project Manager: Nancy Duncan

Organization: NPS Mississippi National River and Recreation Area

College/Department/Division:

M.L. 2018 ENRTF Appropriation: \$200,000

Project Length and Completion Date: 2 years/June 30, 2020

Date of Report: February 19, 2018



ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET	Budget	Amount Spent	Balance
BUDGET ITEM			
Professional/Technical/Service Contracts			
<i>USGS Upper Midwest Environmental Science Center - contract for Activity 1 data collection and products</i>	\$85,860		\$85,860
<i>USGS Upper Midwest Environmental Science Center - contract for Activity 2 data collection and products</i>	\$114,140		\$114,140
COLUMN TOTAL	\$200,000		\$200,000

