



Environment and Natural Resources Trust Fund

2022 Request for Proposal

General Information

Proposal ID: 2022-139

Proposal Title: How Effective and Protective are AIS Removal Methods?

Project Manager Information

Name: Valerie Brady

Organization: U of MN - Duluth - NRRRI

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Project Basic Information

Project Summary: The best way to prevent aquatic invasive species spread is to stop the transfer of water and living material between lakes. We will test how well boat cleaning methods work.

Funds Requested: \$122,000

Proposed Project Completion: June 30 2024

LCCMR Funding Category: Small Projects (H)

Secondary Category: Aquatic and Terrestrial Invasive Species (D)

Project Location

What is the best scale for describing where your work will take place?

Region(s): NE

What is the best scale to describe the area impacted by your work?

Statewide

When will the work impact occur?

In the Future

Narrative

Describe the opportunity or problem your proposal seeks to address. Include any relevant background information.

Boat launch inspections and cleaning campaigns focus largely on the exteriors of boats and trailers with only minimal attention paid to boat interiors and other gear. But even small amounts of water moved between lakes may transfer spiny water fleas (SWF) or zebra mussel larvae. Similarly, mud, debris and water inside the boat could transport seeds, SWF eggs, small snails or bits of invasive vegetation. When we power-washed 5 boats used in wetland research, we captured 4,498 total organisms and plant parts, including more than 24 invertebrate species such as invasive zebra mussels and faucet snails. Faucet snails can carry a parasite that has caused waterfowl die-offs in MN; they are tiny, easily transported, reproduce abundantly, and can survive many days out of water. Anglers (1.4 million MN licenses in 2018) and other boating enthusiasts typically get water, zooplankton, and bits of plant material in their boats. Duck hunters and others going to more shallow, wetland areas may get their boats much dirtier and transport different AIS. Here, we will address the question: How well do various boat cleaning methods work at removing AIS for different user groups, anglers and duck hunters?

What is your proposed solution to the problem or opportunity discussed above? i.e. What are you seeking funding to do? You will be asked to expand on this in Activities and Milestones.

In an ideal world, all boats moved between lakes would be completely squeaky-clean and dry. Unfortunately, this is not happening. While drying kills all aquatic invasives, it can take 5+ days to get boats completely dry in cool, humid weather. Not surprisingly, many people do not wait and instead try to clean their boats. How well do these cleanings work? Most boat launches either have no tools at all (e.g., only hand removal is possible) or have a self-service cleaning station with waterless tools (e.g., brushes, tongs, vacuums). Previous assessments of waterless cleaning station effectiveness have focused on boat and trailer exteriors, not on contamination inside boats. The worst-case scenario is a false sense of security created by poorly-performing cleaning methods. The boat owner thinks all is clean and is unconcerned about moving to another lake, when in reality there are spiny water fleas stuck in the live well, invasive milfoil on the boat floor or faucet snails on their boots. We will test the effectiveness of the self-service (non-DNR) AIS removal methods at cleaning boat interiors against the DNR standard for cleaning, which is to use a power washer to remove AIS.

What are the specific project outcomes as they relate to the public purpose of protection, conservation, preservation, and enhancement of the state's natural resources?

Self-service waterless cleaning stations are being purchased with state funding and placed at many boat launches. Are these stations as effective as possible at preventing AIS spread? How can they be even more effective? Our results will help boat launch and lake managers choose the best cleaning tools for lake protection based on the AIS in their lake; help AIS personnel and agency managers customize AIS removal strategies for particular user groups and water bodies; and provide the information necessary to help cleaning station manufacturers improve their tools. (Note: minimal changes to original proposal, mostly formatting and including reviewer recommendations).

Activities and Milestones

Activity 1: Assess how well self-service AIS removal methods clean boat interiors and gear

Activity Budget: \$111,392

Activity Description:

We designed an experiment to determine the effectiveness of various removal methods at cleaning both a) recreational angler boat interiors and b) duck hunter boat interiors and gear (decoys, boots).

Specifically, we will quantify the living material (potential AIS propagules) removed by cleaning methods available at boat launches:

- 1) visual inspection and hand removal,
- 2) typical boat launch waterless cleaning station,
- 3) low-pressure water rinse from a garden hose, and
- 4) all methods listed above.

Each of these cleaning methods will be compared to the DNR cleaning standard of power washing to determine what was missed. This study design allows us to determine how many potential propagules were removed by each method and how many were missed (by comparison to what is removed by power washing). We will seek input on our study design from agency AIS personnel. Our results will not be influenced by cleaning station manufacturers. This activity can be accomplished with the original budget by slightly reducing statistical replication.

Outcome 1: Determination of removal efficiency of each cleaning method for each type of use: angling and duck hunting.

Outcome 2: Recommendations to improve the performance of boat launch cleaning stations to reduce the risk of AIS spread.

Activity Milestones:

Description	Completion Date
Webinar introducing study to agency AIS personnel, inspectors and managers (added at request of reviewers)	December 31 2022
Cleaning efficiency assessment of 4 AIS removal methods for angler-type boats	February 28 2023
Cleaning efficiency assessment of 4 AIS removal methods for duck hunting boats	February 28 2024
Statistical assessment of cleaning efficiencies for each type of boat: angling and duck hunting	March 31 2024

Activity 2: Information transfer to lake managers, agency AIS personnel and policy makers

Activity Budget: \$10,608

Activity Description:

Task: Inform AIS personnel, agencies (e.g., MNDNR), cleaning station manufacturers, policy makers and researchers of our findings and elicit their assistance in outreach messaging.

We will host a webinar with agency AIS personnel to present our findings and recommendations about which cleaning methods are most effective for removing different types of AIS from boat interiors and gear used for various recreational purposes. We will work with these personnel on outreach messages to target specific user groups that may differ in their use of boats and gear or be more likely to spread different types of AIS. Importantly, we will make recommendations to cleaning station manufacturers on upgrades or changes that may improve the removal efficiency of these stations.

Outcome 1. Recommendations provided for a) cleaning method effectiveness at removing different types of AIS; b) the best AIS removal methods and messaging for various user groups, equipment types, and AIS; and c) improving cleaning station tools and options.

Outcome 2. Relay project results, messages and recommendations by a) presenting at the Minnesota Aquatic Invaders Summit (which is well attended by AIS researchers, managers and inspectors), b) presenting at other regional conferences, and c) a scientific publication.

Activity Milestones:

Description	Completion Date
Webinar with AIS professionals for information transfer and to craft outreach messages and recommendations	April 30 2024
Presentation at MN Aquatic Invaders Summit and similar venues, write manuscript	June 30 2024

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Edgar Rudberg	CD3 Company	The CD3 Company is collaborating with us and providing in-kind match. They will provide a cleaning station and an engineer to assist us in configuring the cleaning station for optimal sample collection at no cost. They have agreed to have no influence on this study or interpretation of results.	No

Long-Term Implementation and Funding

Describe how the results will be implemented and how any ongoing effort will be funded. If not already addressed as part of the project, how will findings, results, and products developed be implemented after project completion? If additional work is needed, how will this be funded?

This project will assess the effectiveness of 4 AIS removal methods to clean the interiors of angling and duck hunting boats. Managers across MN can use our results to determine what cleaning tools and methods will work best depending on lake usage and types of AIS present. Because this is an independent assessment of typical non-DNR cleaning stations, station manufacturers can use these results to increase the effectiveness of their cleaning stations. Long term, reduction in the transportation of water and biotic materials will slow the spread of AIS in Minnesota.

Other ENRTF Appropriations Awarded in the Last Six Years

Name	Appropriation	Amount Awarded
MAISRC Subproject 15: Determining Highest Risk Vectors of Spiny WaterFlea Spread	M.L. 2017, Chp. 96, Sec. 2, Subd. 06a	\$0

Project Manager and Organization Qualifications

Project Manager Name: Valerie Brady

Job Title: Senior Research Program Manager

Provide description of the project manager's qualifications to manage the proposed project.

Dr. Valerie J. Brady, a Research Program Manager at NRRI, has been leading research on aquatic invertebrates, food webs and invasive species since her dissertation research on zebra mussel effects on wetland invertebrates and zooplankton in Saginaw Bay, Lake Huron, coastal wetlands in the mid-1990s. For the past two decades she has coordinated large research and monitoring programs across the coastlines of the Great Lakes investigating and improving coastal ecosystem condition indicators and linking these to anthropogenic causes and stressors. She has a current MAISRC grant investigating the invasive spiny water flea fouling of fishing gear. Brady has successfully managed numerous federal and state grants collectively worth over \$3M.

The team's fisheries ecologist is Mr. Josh Dumke, Senior Research Scientist at NRRI. Mr. Dumke has over 10 years of experience in aquatic ecology, fisheries, and performing field collection, as well as 5 years' experience coordinating and supervising technicians working on large aquatic projects. Relevant experience includes fish and invertebrate field collection and taxonomy, safe boating practices on large lakes (including the Great Lakes), management and training of field staff, data analysis, and boat/equipment decontamination procedures to prevent the spread of aquatic invasive species during research endeavors.

The team includes two professionally-certified taxonomists, Ms. Holly Wellard Kelly and Mr. Robert Hell, who have at least 15 years of experience identifying aquatic invertebrates, zooplankton, and algae. Wellard Kelly recently led the effort to refine the experimental design of the St. Louis County and MAISRC projects investigating spiny water flea fouling of fishing gear.

Most project personnel are NRRRI research staff (not teaching faculty) who receive minimal salary support from UMD; they are largely paid on grant monies and their effort on this project will be paid from ENTRF.

Organization: U of MN - Duluth - NRRRI

Organization Description:

The Natural Resources Research Institute (NRRRI) is an applied research and economic development engine for the University of Minnesota research enterprise. NRRRI employs over 130 scientists, engineers and technicians to support its mission to deliver research solutions to balance our economy, resources and environment for resilient communities. NRRRI collaborates broadly across the University system, the state and the region to address the challenges of a natural resource-based economy.

NRRRI researchers have extensive experience in managing large, interdisciplinary projects. NRRRI's role is as an impartial, science-based resource that develops and translates knowledge. Projects include characterizing resource opportunities, minimizing waste and environmental impact, maximizing value from natural resources and maintaining/restoring ecosystem functions.

The Aquatic Ecosystem Assessment Laboratory is a 2,500 square foot facility within NRRRI. Laboratory staff include aquatic macroinvertebrate, algae, and diatom taxonomists and fisheries ecologists. Staff are experienced at identifying aquatic organisms, assessing organism assemblages, evaluating aquatic habitat conditions, and establishing biological condition indicators. Equipment includes a variety of high quality research-grade microscopes. Field sampling equipment includes a fleet of sampling vessels; a variety of invertebrate, water sampling and benthic coring devices; water quality instrumentation units; shallow water electrofishing equipment; and fish trap nets.

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	\$ Amount
Personnel								
Principal Investigator Valerie Brady		Overall project management and coordination; lead reporting and outreach. NRRRI research staff (not teaching faculty) receive minimal salary support from UMD; they are largely paid on grant monies and their effort on this project will be paid from ENTRF.			26.7%	0.08		\$9,949
Co-investigator Josh Dumke		Day-to-day coordinator of project; leads data analysis, assists with reporting and outreach. NRRRI research staff (not teaching faculty) receive minimal salary support from UMD; they are largely paid on grant monies and their effort on this project will be paid from ENTRF.			26.7%	0.42		\$36,692
Taxonomists (Robert Hell and Holly Wellard Kelly)		Lead laboratory analysis and sample processing; assist with data analysis and reporting. NRRRI research staff (not teaching faculty) receive minimal salary support from UMD; they are largely paid on grant monies and their effort on this project will be paid from ENTRF.			24.1%	0.66		\$45,586
Technician		Assist with all aspects of project. NRRRI research staff (not teaching faculty) receive minimal salary support from UMD; they are largely paid on grant monies and their effort on this project will be paid from ENTRF.			24.1%	0.24		\$13,027
Summer technician or student		Will assist the technician with all aspects of the field portion of the project.			7.4%	0.28		\$11,435
							Sub Total	\$116,689
Contracts and Services								
							Sub Total	-
Equipment, Tools, and Supplies								

	Tools and Supplies	General field supplies	Livewell proxy; duck decoys, sieving and netting material, filters for CD3 machine, capture mats to capture items washed from boats; vials and bottles for sample storage; ethanol preservative for samples					\$3,375
	Tools and Supplies	Lab supplies	Waterproof paper, pails for sample storage, waterproof pencils and markers					\$108
							Sub Total	\$3,483
Capital Expenditures								
							Sub Total	-
Acquisitions and Stewardship								
							Sub Total	-
Travel In Minnesota								
	Miles/ Meals/ Lodging	Travel for fieldwork	Travel to local wetland to obtain biotic items, mud, and water for tests. 33 miles round trip at \$0.56/mile, estimated 15 trips with 2 work trucks and boats.					\$555
	Miles/ Meals/ Lodging	Outreach travel	Travel to give presentations to agencies about project and results. Estimated 235 miles at \$0.56/mile and standard per diem for 2 days.					\$214
	Conference Registration Miles/ Meals/ Lodging	Travel to Minnesota Aquatic Invasive Species Conference to present results.	Two people, estimated 365 miles round trip, one night, with per diem and conference registration estimated at \$225 each.					\$1,059
							Sub Total	\$1,828
Travel Outside Minnesota								

							Sub Total	-
Printing and Publication								
							Sub Total	-
Other Expenses								
							Sub Total	-
							Grand Total	\$122,000

Classified Staff or Generally Ineligible Expenses

Category/Name	Subcategory or Type	Description	Justification Ineligible Expense or Classified Staff Request
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Non ENRTF Funds

Category	Specific Source	Use	Status	Amount
State				
			State Sub Total	-
Non-State				
In-Kind	CD3 waterless cleaning station use donated by CD3 Company along with staff time.	The CD3 company has agreed to provide us with a CD3 waterless cleaning station free of charge for this project (value \$2000) and are additionally providing the time of the CEO (40 hrs) and an engineer (40 hrs) to assist with the project (value \$10,000). See attached match letter.	Secured	\$12,000
In-Kind	UMN unrecovered indirect costs are calculated at the UMN negotiated rate for research of 55% modified total direct costs.	Indirect costs are those costs incurred for common or joint objectives that cannot be readily identified with a specific sponsored program or institutional activity. Examples include utilities, building maintenance, clerical salaries, and general supplies. (https://research.umn.edu/units/oca/fa-costs/direct-indirect-costs)	Secured	\$67,100
			Non State Sub Total	\$79,100
			Funds Total	\$79,100

Attachments

Required Attachments

Visual Component

File: [938c1516-146.pdf](#)

Alternate Text for Visual Component

Our visual shows our study design testing 4 AIS removal methods on two types of boats (angling and duck hunting) against the DNR-preferred boat cleaning method of high pressure power washing. We will assess how many items were removed and missed by each boat cleaning method....

Optional Attachments

Support Letter or Other

Title	File
UMD SPA Transmittal Letter	c95dc02b-bb4.pdf
CD3 Company letter of collaboration	afa65358-aae.pdf

Administrative Use

Does your project include restoration or acquisition of land rights?

No

Does your project have potential for royalties, copyrights, patents, or sale of products and assets?

No

Do you understand and acknowledge IP and revenue-return and sharing requirements in 116P.10?

N/A

Do you wish to request reinvestment of any revenues into your project instead of returning revenue to the ENRTF?

N/A

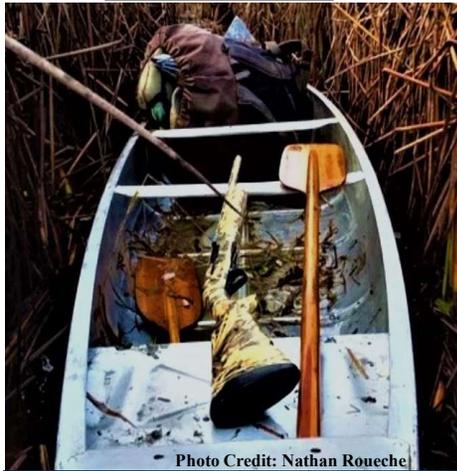
Does your project include original, hypothesis-driven research?

Yes

Does the organization have a fiscal agent for this project?

Yes, Sponsored Projects Administration

Test boats:



Duck hunting boat type



Angler boat type

AIS removal methods:



Boat on wash capture mat

Number removed by each method:



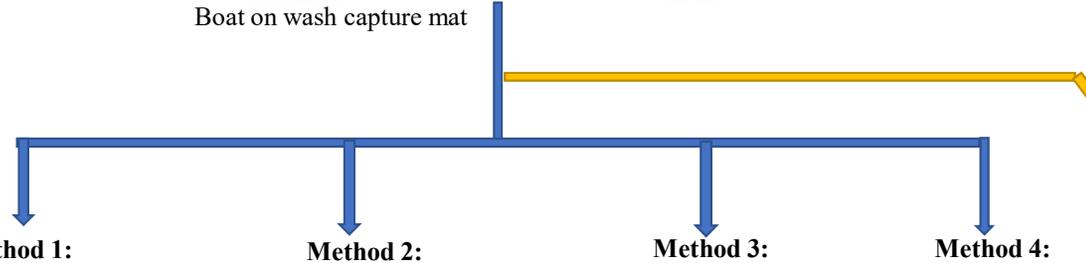
Zooplankton like Spiny water flea



Plant material like Eurasian water milfoil



Invertebrates like Faucet snail



Method 1:



Visual inspection and removal by hand

Method 2:



Visual inspection and cleaning station tools (e.g. tongs, air blower, vacuum, and scrub brush)

Method 3:



Visual inspection and low-pressure water hose

Method 4:



Methods 1, 2 and 3 combined

Compared with:



High-pressure power washer

