

**Environment and Natural Resources Trust Fund  
2016 Request for Proposals (RFP)**

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**Project Title:**

**ENRTF ID: 133-D**

Rapid Response Mobile Ballast Water Treatment System

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**Category:** D. Aquatic and Terrestrial Invasive Species

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**Total Project Budget:** \$ 498,068

**Proposed Project Time Period for the Funding Requested:** 2 years, July 2016 to June 2018

**Summary:**

Project will demonstrate a rapid response mobile ballast water treatment system to prevent invasive species introductions into Minnesotas Lake Superior ports. Project outcomes include three shipboard efficacy trials.

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**Sponsoring Organization:** Izaak Walton League of America - Minnesota Division

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**Location**

**Region:** NE

**County Name:** Cook, Lake, St. Louis

**City / Township:**

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**Alternate Text for Visual:**

Ballast AIS vector diagram and images of prototype system

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



## Environment and Natural Resources Trust Fund (ENRTF)

### 2016 Main Proposal

**Project Title:** Rapid Response Mobile Ballast Water Treatment System

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#### I. PROJECT STATEMENT

This project goal is to reduce the threat of new aquatic invasive species (AIS) in the Great Lakes by demonstrating a mobile rapid response ballast water treatment systems. These systems will be activation ready for high risk ship arrivals or regulatory interventions in Minnesota or the region. In order to accomplish this goal, we need to confirm biological efficacy and practicality of the system in freshwater.

The EPA identified ballast water from ships as the source of 65% of past invasions. Recent US Coast Guard and EPA rule developments will eventually lead to wide-scale installation of on-board ballast water treatment systems (BWTS). However, there are a number of potential gaps in the ballast treatment regulatory framework and thus, Minnesota's Lake Superior harbors, particularly Duluth, face potentially high risk ballast discharges from a variety of sources. For example, most of the largest ballast movers in the Great Lakes are currently exempted from the requirements. Also, BWTS requirements will not be fully in effect until 2021 at the earliest. Additionally, there exists a high likelihood of mechanical failure of installed BWTS given that these are new technologies in difficult operating environments.

Minnesota could implement this system at its Lake Superior ports to prevent the release of ballast deemed high risk for any of the above situations. For example, the Wisconsin Department of Natural Resources (WDNR) included as a condition on their 401 Certification of the EPA's ballast water discharge general permit the following language: "WDNR may require emergency treatment as part of a temporary compliance plan or temporary alternative strategy for vessels with un-exchanged or untreated ballast water discharge of high-risk ballast water." Furthermore, WDNR may authorize treatment using technologies shown to be promising as a means of dealing with these potential high-risk discharges. Minnesota has authority to adopt a similar approach.

Implementation would be a two-step process. The first step is to conduct a risk assessment. Our team is working with the State of Wisconsin on a rapid assessment protocol using existing knowledge of potential Great Lakes invaders. The second step is the rapid response. Options include in-tank treatment, offloading of ballast, or no discharge. Offloading ballast presents substantial obstacles. In-tank treatment systems mix biocides into a tank for treatment and face the main obstacle of mixing a large volume of water in a baffled tank designed to prevent mixing. Previous work by our team (with funding in part from LCCMR) has overcome that initial challenge.

Our team designed a skid-mounted, mobile BWTS that allows for ballast treatment on an array of vessels. The BWTS was tested this fall aboard a California Maritime Academy training ship in conjunction with Moss Landing Laboratories and was proven successful for brackish water (12-22 psu). However, freshwater trials are needed to confirm applicability in the Great Lakes. Overarching outcomes for the project include: 1) Eliminating introduction and transfer of invasive species, and 2) Reducing resources required to restore or manage ecosystems negatively impacted by invasive species

#### II. PROJECT ACTIVITIES AND OUTCOMES

##### **Activity 1:** Ship Demonstration and Efficacy Trials

**Budget: \$ 498,068**

The project involves ship trials of a prototype treatment system. A mixing device is lowered into a ballast tank and a chlorine-based biocide is added then held in the tanks for an appropriate amount of time. The dose quantity depends on the quantity of ballast water, available contact time, and ambient demand of the intake waters. The chlorine is neutralized by ascorbic acid (vitamin C) or a sodium sulfate compound rendering the treated ballast water safe for discharge. All discharges will meet standards prior to release and Whole Effluent Toxicity tests following EPA guidelines using three standard freshwater test organisms will be conducted.



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In order to prove that this concept works for treatment we need to be able to prove risk reduction (log kills of organisms) aboard a ship. Meeting this goal requires biological efficacy trials to demonstrate the system’s ability to reduce organism numbers substantially (comparable to or better than the reduction provided by ballast water exchange). Continuous in-line sampling occurs during ballast operations and then samples are subject to live/dead analysis for zooplankton, phytoplankton and bacteria/viruses.

<b>Outcome</b>	<b>Completion Date</b>
1. First of three trials to demonstrate application and determine efficacy in ship testing environment	<i>Fall 2016</i>
2. Second and third ship trials (conducted on ship of opportunity will be completed in 2016 if ships are available)	<i>Summer 2017</i>
3. Reporting and Outreach	<i>Summer 2018</i>

**III. PROJECT STRATEGY**

**A. Project Team/Partners**

The Izaak Walton League of America – Minnesota Division, St. Paul, MN will be the LCCMR single point of contact, performing all contacting efforts and ensuring appropriate and timely reporting of progress. Environmental protection specialist, Dr. Jeffrey Henquinet, would serve as project manager and oversee permitting. *Partners Receiving Funding:* The Grand Portage Band of Minnesota Chippewa Tribe will provide two rapid responders trained in deployment of the mobile BWTS will support shipboard testing. Glosten, marine engineering firm, will oversee deployment on the ship trial. The Great Ships Initiative will provide scientists to conduct the sampling and analysis for biological efficacy and residual toxicity. *Partners Contributing Funding:* The National Park Service and Minnesota Department of Natural Resources will contribute funding for the first trial. Phyllis Green, National Park Service, will provide in-kind regulatory support.

**B. Project Impact and Long-Term Strategy**

It is envisioned that the system could be utilized nationally or internationally by a combination of port and canal-zone based response teams, salvors and/or shipping companies. This system could fill several gaps in the current regulatory framework, such as inadequate vessel ballast treatment occurs from mechanical failures or exempted ships, e.g. Lakers, near coastal vessels, and inland vessels. This is the only proposal for this type of system at the moment. State regulators in Minnesota, Michigan, Wisconsin, and New York have all expressed interest in this project. In addition to having a tool for rapid response deployment at MN ports, the results of the demonstration will be shared with Great Lakes states, thus substantially improving protection of Minnesota waters. LCCMR Grant #33784 enabled us to develop and trial advanced ballast water mixing methods and deliver the world’s first emergency response guide (report and more info at [tinyurl.com/ndhlnq](http://tinyurl.com/ndhlnq)). This groundwork was leveraged significantly and eventually led to the construction and trialing of a prototype system (see attached memo on prototype). LCCMR support can help finalize this effort.

**C. Timeline Requirements**

This project will span approximately 2 years with biological efficacy testing coordinated to meet required water quality and organism density “challenge” conditions. Depending on funding availability an initial ship trial could be conducted in fall 2016, when a salt water ship of opportunity schedule schedules a visit to the Port of Duluth.

## 2016 Detailed Project Budget

**Project Title:** Rapid Response Mobile Ballast Water Treatment System

### IV. TOTAL ENRTF REQUEST BUDGET 2 years

<u>BUDGET ITEM</u>	<u>AMOUNT</u>
<b>Personnel:</b>	\$ -
Grant manager: 6% FTE, contracting, communications, and reporting. (100% salary, 0% benefits, 2 years, 1 person in position)	\$ 7,200
Project Manager: 12.6% FTE, Project oversight and reporting. (100% salary, 0% benefits, 2 years, 1 person in position)	\$ 20,160
<b>Professional/Technical/Service Contracts:</b>	\$ -
Shipyards: RFP; Loading equipment and deployment support	\$ 18,000
Glosten (Marine Engineers): Planning and 2 pers. for ship trials	\$ 148,000
Grand Portage Band: 2 pers. rapid response crew for ship trials	\$ 53,136
Great Ships Initiative: Efficacy and residual toxicity tests.	\$ 180,000
Shipping Company: RFP; shipping prototype	\$ 10,000
<b>Equipment/Tools/Supplies:</b>	\$ -
Bulk chemicals for treatment and neutralization	\$ 4,500
Chemical sampling and handling supplies	\$ 2,700
Generator rental to run ballast water mixing system	\$ 6,000
Construction of second prototype system	\$ 45,000
<b>Acquisition (Fee Title or Permanent Easements):</b>	NA
<b>Travel:</b>	\$ -
Proj. Manager travel to Duluth.	\$ 3,372
<b>Additional Budget Items:</b>	\$ -
<b>TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND \$ REQUEST =</b>	<b>\$ 498,068</b>

### V. OTHER FUNDS

<u>SOURCE OF FUNDS</u>	<u>AMOUNT</u>	<u>Status</u>
<b>Other Non-State \$ To Be Applied To Project During Project Period:</b>	\$ -	
National Park Service	\$ 50,000	<i>Secured</i>
Great Ships Initiative, may be willing to conduct biological efficacy sampling and analysis at no cost to the project. Testing costs are included in the budget above, but could be eliminated if GSI provides the testing free of charge.	\$ 180,000.00	<i>Pending</i>
<b>Other State \$ To Be Applied To Project During Project Period:</b>	\$ -	
Minnesota Department of Natural Resources	\$ 50,000	<i>Pending</i>
<b>In-kind Services To Be Applied To Project During Project Period:</b>	\$ -	
Support from shipping company for project support including crew time, supplies, etc., approx. \$5k per trial	\$ 15,000	<i>Pending</i>
<b>Funding History:</b>	\$ -	
Great Lakes Fisheries Trust: trial of passive ballast water mixing methods (2009)	\$ 185,000	
LCCMR Grant #33784: trial of advanced ballast water mixing methods (2009)	\$ 125,000	
US Maritime Administration: design and construction of prototype mixing system (2012)	\$ 125,000	
<b>Remaining \$ From Current ENRTF Appropriation:</b>	NA	

# Project Title: Rapid Response Mobile Ballast Water Treatment

## The Ballast Water Vector for Aquatic Invasive Species

### BALLAST WATER BRINGS UNWANTED SPECIES

Oceangoing ships fill ballast tanks with millions of gallons of water for stability when their cargo holds are empty. The water may contain creatures that can be carried into the Great Lakes. Even empty ballast tanks hold residual water and mud that may contain tiny creatures.



Source: Star Tribune research

RAY GRUMNEY • Star Tribune

## The Mobile Ballast Water Treatment System

### How Emergency Treatment Works

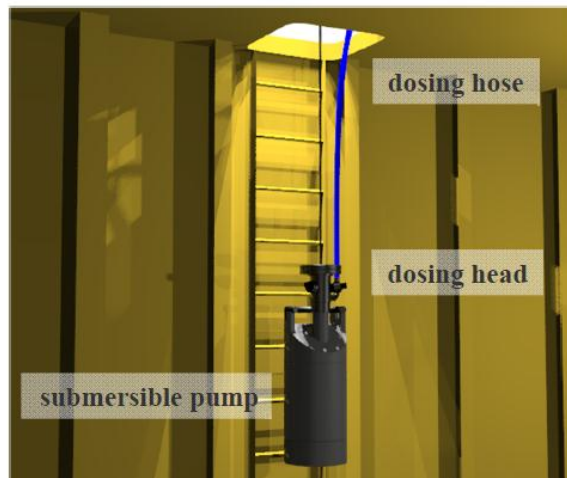
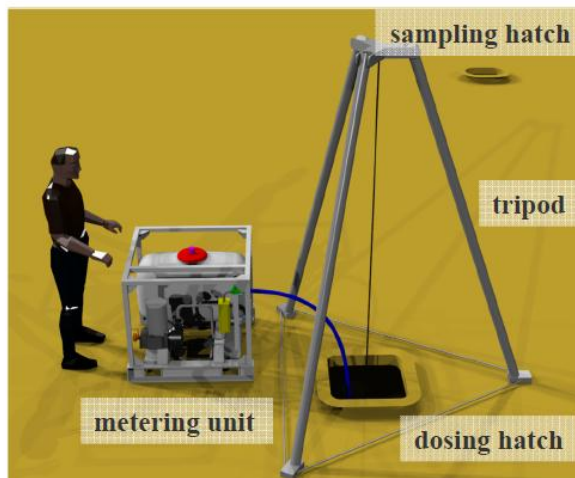
The work to date has been performed with full ballast water tanks along with implementation of best management practices. Emergency treatment consists of three basic steps:

- 1) A mixing device is lowered into a full ballast water tank through an existing manhole or (in emergencies) cut opening.
- 2) An active substance is added to the ballast tank being mixed.
- 3) A neutralizing agent is added in the same manner as the active substance to render the treated ballast water as safe for discharge to local waters.



Dosing

Mixing



## Project Manager Qualifications & Organization Description

### **Project Manager:**

Dr. Jeffrey Henquinet, 906-281-2002

### **Qualifications:**

Dr. Henquinet has extensive experience in the areas of environmental law and policy, NEPA compliance, and project/program management. In recent years, he has been heavily involved in research related to preventing the introduction and spread of invasive species in the Great Lakes. Dr. Henquinet served as project manager on two projects focused on the treatment of ballast water in ships to prevent the introduction or spread of invasive species:

1. A \$500,000 Great Lakes Restoration Initiative funded selection and installation ballast treatment system aboard the NPS passenger vessel, Ranger III.
2. A \$1,046,000 Great Lakes Restoration Initiative funded research project on the development of a permanent treatment system for Great Lakes freshwater-only vessels using sodium hydroxide as the biocide.

Dr. Henquinet has worked with all of the partners involved in the proposed projects. He has been involved in mixing and active biocide trials with the ballast tank mixing technology used in the prototype system. Dr. Henquinet has also been working with the partners to develop the biocide dosing and monitoring protocol for this project.

Dr. Henquinet has received a Ph.D. Fisheries & Wildlife from Michigan State University, a J.D. from Lewis and Clark Law School, and a B.Sc. (cum laude) Biology with chemistry minor from University of Wisconsin – La Crosse.

### **Organization Description:**

Founded in 1922, the Izaak Walton League is one of the nation's oldest and most respected conservation organizations. With a powerful grassroots network of more than 250 local chapters nationwide, the League takes a common-sense approach toward protecting our country's natural heritage and improving outdoor recreation opportunities for all Americans. The League's mission is to conserve, restore, and promote the sustainable use and enjoyment of our natural resources, including soil, air, woods, waters, and wildlife. Chapters were formed throughout the Midwest to rally the League's pledge "to defend soils, woods, water, and wildlife". The IWLA's Minnesota Division and local chapters have a long history of action and are involved in conservation issues through education, lobbying, and a multitude of local conservation projects. The Minnesota Division has a regional office located in Saint Paul, Minnesota and concentrates on issues in the Mississippi River states with emphasis on energy efficiency, hydro-power, and sustainable agriculture.

The Division successfully oversaw a \$200,000 LCCMR grant from 1999-2001 with Barbara Toren serving as project manager. The project involved planning and implementing statewide sustainability forums.