Environment and Natural Resources Trust Fund
2015 Request for Proposals (RFP)

Project Title: **ENRTF ID:** **086-D**

Mobile Ballast Water Treatment System for Great Lakes

Category: D. Aquatic and Terrestrial Invasive Species

Total Project Budget: $ 1,006,200

Proposed Project Time Period for the Funding Requested: 2 years, July 2015 - June 2017

Summary:

Project will deploy two mobile ballast treatment systems in Minnesota to prevent invasive species introductions from high risk ships. Project outcomes include three shipboard efficacy trials, system optimization, and deployment.

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Sponsoring Organization: Izaak Walton League of America

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Location

Region: NE

County Name: Cook, Lake, St. Louis

City / Township:

Alternate Text for Visual:

Overview of Mobile Ballast Water Treatment System

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

PROJECT TITLE: Mobile Ballast Water Treatment System for Great Lakes

I. PROJECT STATEMENT

This project goal is to reduce the threat of new aquatic invasive species (AIS) in the Great Lakes by ***demonstrating and deploying two (2) mobile risk 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 1) **test and demonstrate** biological efficacy and practicality of the system; 2) **optimize the existing prototype** for use in the widest variety of common ballast tank configurations; 3) **provide two deployment ready systems** to a willing partner.

The EPA identified ballast water from ships as the source of 65% of invasions from 1960-2006. Ballast introduced AIS pose a tremendous threat to aquatic resources in the Great Lakes. Management costs in the Great Lakes related to AIS such as zebra mussels range from a conservative $200 million to $5.7 billion and does not include damage to the large lakes food webs. Recent US Coast Guard and EPA rule developments will eventually lead to wide-scale installation of onboard 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 face potentially high risk ballast discharges from a variety of sources. For example, Great Lakes freight vessels (Lakers) are currently exempted from regulations and includes some vessels that sail in coastal waters such as the St. Lawrence. Also, BWTS requirements will not be fully in effect until 2021 at the earliest for salt water vessels. Additionally, there exists a high likelihood of mechanical failure of installed BWTS given that these are new technologies in difficult operating environments.

The Minnesota Pollution Control Agency could implement this system at Minnesota ports to prevent the release of ballast deemed high risk for any of the above situations. Risk can be determined through assessment of ballast management practices, species composition, ballast water source, or other methods. In addition to having a tool for rapid response deployment at MN ports, the results of the demonstration can and will be shared with Great Lakes states, thus substantially improving protection of Minnesota waters.

II. PROJECT ACTIVITIES AND OUTCOMES

Activity 1: Ship Demonstration and Efficacy Trials **Budget: $ 486,700**

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). If activities two and three are funded, testing in 2016 would use the optimized system.

Outcome	Completion Date
1. First of three trials to demonstrate application and determine efficacy in ship testing environment	*1 Nov. 2015*
2. Second and third ship trials (possibly using optimized treatment system if activities 2 and 3 receive funding)	*1 Nov. 2016*
3. Reporting and outreach	*1 Feb. 2017*

Activity 2: Mixing Technology Development **Budget: $ 239,500**

Previous field trials performed on the training ship Golden Bear demonstrated the ability of the prototype system to mix ballast tanks with capacities of approximately 350 cubic meters and complex geometry. Great Lakes freight vessels ballast tanks have multiple configurations, each presenting a challenge for mixing and/or deployment of a treatment system. The proposed effort will identify common tank designs and optimize/develop/test mixing technologies for this treatment system.

Outcome	Completion Date
1. Establish standard method to evaluate mixing system efficiency	*1 Nov. 2015*
2. Survey typical common vessel tank configurations	*1 Nov. 2015*
3. Perform scale and field tests to optimize existing prototype and two additional mixing methods	*1 June 2016*

Activity 3: Deployment of Two System within the Great Lakes **Budget: $ 280,000**

The desired outcome is deployment of two mobile ballast treatment systems at a port or locks in the Great Lakes region. This will require regulatory approvals of the system for safe and environmentally compliant use. Additionally, the project will support training of a crew to use the system. Outreach will include at a minimum presentations to the Bi-National Ballast Water Forum, Great Lakes Ballast Water Collaborative, and Great Lakes Aquatic Nuisance taskforce. Additionally, team scientists and engineers will share information from this project across a diverse forum in academia and the professional environment with others at regional and national conferences.

Outcome	Completion Date
1. Develop system deployment handbook, ballast tank configuration library, and implementation recommendations	*1 Mar. 2017*
2. Submit data for review to US Coast Guard and Environmental Protection Agency	*1 May 2017*
3. Deploy two systems and train Great Lakes implementation team	*1 June 2017*
4. Outreach and reporting	*1 July 2017*

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. Jeff Henquinet, would serve as project manager and oversee permitting. *Partners Receiving Funding*: Dr. Barnaby Watten, US Geological Survey, will head research and development efforts. Kevin Reynolds, the Glosten Associates, a naval architecture firm, will oversee ship trials. *Partners Not Receiving Funding:* Phyllis Green, National Park Service, will liaison with federal and local agencies.

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, Wisconsin, and New York have all expressed interest in this project. 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/ndhlhnq). 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 2015, if a ship of opportunity is identified.

2015 Detailed Project Budget

Project Title: *Mobile Ballast Water Treatment System for Great Lakes*

IV. TOTAL ENRTF REQUEST BUDGET 2 years

BUDGET ITEM	AMOUNT
Personnel: IWLA Contracting and Grant Manager: 10% FTE for two years (100% salary, 1 pers.).	$ 9,000
Dr. Jeff Henquinet, Project Manager: 10% FTE for two years (100% salary, 1 pers.).	$ 20,000
Contracts: US Geological Survey, Services of Dr. Barnaby Watten and research assistants for mixing technology development and testing, ship trial participation, report writing.	$ 314,000
Marine engineering firm, engineering services, ship trial participation, treatment system construction, regulatory approvals, reporting.	$ 340,800
Research services firm, biological effiacy sampling and analysis during three shiptrials. ****If Great Ships Initiative will committ to no cost participation, this amount could be eliminated thereby reducing the overall project cost.* ***	$ 180,000
Grand Portage Band of Lake Superior Chippewa, One response staff on three ship trials, resposne staff crew implementation/operation training	$ 52,400
Equipment/Tools/Supplies: Two (2) optimized emergency ballast treatment systems for	$ 90,000
Acquisition (Fee Title or Permanent Easements):	NA
Travel:	NA
Additional Budget Items:	NA
TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND $ REQUEST =	$ 1,006,200

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: National Park service 2017 funding for 1 ship trial and construction of a skid intended for deployment by NPS.	$ 205,288	*Secured*
Great Ships Initiative, may be willing to conudct 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	*Pending*
Other State $ To Be Applied To Project During Project Period:	NA	*NA*
In-kind Services To Be Applied To Project During Project Period: Time and travel for outreach by NPS, Glosten, USGS, approx $3k per entity.	$ 9,000	*Secured*
Support from shipping company for project support including crew time, room & board during shiptrial, etc., approx. $25k per trial ($75k total)	$ 75,000	*Pending*
USGS, Instrumentation required activity two (value $28K), construction of test tanks (value $25K).	$ 52,000	*Secured*
Funding History: GLFT, $185k, trial of passive ballast water mixing methods (2009) LCCMR Grant #33784, $125k, trial advanced ballast water mixing methods (2009) MARAD, $125k, design and construction of prototype mixing system (2012)	$ 435,000	
Remaining $ From Current ENRTF Appropriation:	NA	*NA*

THE GLOSTEN ASSOCIATES
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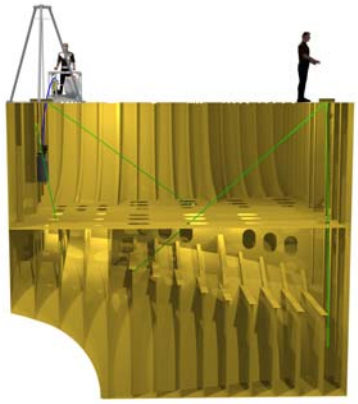
NATIONAL PARK SERVICE

Emergency Treatment of Marine Vessel Ballast Water

Since 2008, The Glosten Associates has partnered with the US Geological Survey (USGS) to develop rapid deployment of ballast water emergency treatment. This critical technology was pioneered by National Park Service with the *Igloo Moon* casualty in 1994 and then as interim treatment on the *Ranger III* in 2007. Glosten and the USGS performed trials on the Great Lakes bulk carrier *M/V Indiana Harbor* and the *Training Ship Golden Bear*.



Installed System, Looking Outboard

The team has focused its development on emergency treatment of vessels that either arrive in port with unmanaged ballast water, or that have been grounded and need to discharge unmanaged ballast water. These methods may also be used for interim treatment to bridge the time gap before wide-scale refitting with permanent, type-approved systems can occur.

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.

The cognizant authority directs the administration of both the active substances and neutralizing agent. Initial trials indicate that the treatment process would take 24 to 48 hours.

***T/S Golden Bear* Prototype Trial**

Glosten effectively mixed a complex tank configuration with a severely partitioned floor in less than one hour.

Chemical Metering Skid

Mixing System Setup

Further Information

Reports and guides related to this project can be viewed at The National Park Service (http://www.nps.gov/isro/naturescience/handling-ballast-water-to-control-non-indigenous-species.htm), and The Glosten Associates (http://www.glosten.com/papers.html).

The team is seeking additional funding to develop biological efficacy testing technologies, analysis approaches for various tank configurations, and methods to test and verify interim treatment measures.

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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.