

2009 Project Abstract

For the Period Ending June 30, 2012

PROJECT TITLE: Emergency Delivery System Development for Disinfecting Ballast Water
PROJECT MANAGER: Scott Smith
AFFILIATION: USGS Western Fisheries Research Center
MAILING ADDRESS: 6505 NE 65th St.
CITY/STATE/ZIP: Seattle, WA 98115
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WEBSITE: [If applicable] \
FUNDING SOURCE: Environment and Natural Resources Trust Fund
LEGAL CITATION: M.L. 2009, Chap. 143, Sec. 2, Subd. 6(b)

APPROPRIATION AMOUNT: \$590,000

Overall Project Outcome and Results

This project was part of Phase III of an overall effort to produce an Emergency Response Guide to Handling Ballast Water to Control Non-Indigenous Species. Phase I (\$25,000) was funded by National Oceanic and Atmospheric Administration and resulted in a study plan entitled "Mixing Biocides into Ships' Ballast Water: Efficiency of Novel Methods." Phase II (\$185,000) was funded by the Great Lakes Fisheries Trust and studied in-line injection, bulk dye dosing, perforated hose dosing, and passive mixing methods, such as ship's motion.

Similar to Phase II, this effort (Phase III) prepared ballast tank mixing and sampling equipment, field work on a working ship to trial promising ballast mixing methods, and analysis/report. The active methods being studied in Phase III are venturi eductors and air lifts. The outcome will be the incorporation of these methods (if determined to be effective and practical) into a best practices guide for treating the ballast water of ships either:

- Arriving in port with high risk ballast water,
- Leaving a port that contains ballast known to be high risk for the destination port, or
- Grounded and laden with high risk, untreated ballast water.

Use and Dissemination

Preliminary information from Result 1 and Result 2 activities were shared at the May 18, 2010 Great Lakes Ballast Water Collaborative meeting in Montreal, QC and at the June 1, 2010 Lake Superior Binational Program - Invasive Species Workshop in Duluth, MN.

The final project results consisting of two reports entitled "Emergency Response Guidance for Handling Ballast Water to Control Aquatic Invasive Species" and "Mixing Biocides into Ship's Ballast Water—Great Lakes Bulk Carrier Field Trials" are posted on the National Park Service web site at <http://www.nps.gov/isro/naturescience/handling-ballast-water-to-control-non-indigenous-species.htm>

Trust Fund 2009 Work Program

Date of Report: 7 December 2012
Date of Next Progress Report: FINAL
Date of Work Program Approval: 1 June 2010
Project Completion Date: 30 June 2011

I. PROJECT TITLE: Emergency Delivery System Development for Disinfecting Ballast Water
Project Manager: Scott Smith
Affiliation: USGS Western Fisheries Research Center
Mailing Address: 6505 NE 65th St.,
City / State / Zip: Seattle, WA 98115
Telephone Number: 206-427-8374
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Web Site Address: N/A

Location:

Project work, both previously completed efforts and the current effort, has taken place on board the ship, *M/V Indiana Harbor*, as it has transited through the Great Lakes.

Total Trust Fund Project Budget:	Trust Fund Appropriation	\$	125,000
	Minus Amount Spent:	\$	125,000
	Equal Balance:	\$	0

Legal Citation: M.L. 2009, Chap. 143, Sec. 2, Subd. 6b

Appropriation Language: (b) Emergency Delivery System Development for Disinfecting Ballast Water. \$125,000 is from the trust fund to the commissioner of the Pollution Control Agency for an agreement with the United States Geological Survey to test the viability of treating ballast water through access ports or air vents as a means to prevent the spread of invasive species.

II. PROJECT SUMMARY AND RESULTS:

This project is **Phase III** of an overall effort to produce an Emergency Response Guide to Handling Ballast Water to Control Non-Indigenous Species. Phase I (\$25,000) was funded by NOAA and resulted in a study plan entitled "Mixing Biocides into Ships' Ballast Water: Efficiency of Novel Methods." Phase II (\$185,000) was funded by the Great Lakes Fisheries Trust and studied in-line injection, bulk dye dosing, perforated hose dosing and passive mixing methods, such as ship's motion.

Similar to Phase II, this effort (**Phase III**) prepared ballast tank mixing and sampling equipment, field work on a working ship to trial promising ballast mixing methods, and analysis/report. The active methods being studied in Phase III are venturi eductors and air lifts. The outcome will be the incorporation of these methods (if determined to be effective and practical) into a best practices guide for treating the ballast water of ships either:

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III. PROGRESS SUMMARY

Project completed

IV. OUTLINE OF PROJECT RESULTS:

Result 1: Logistics and Equipment Preparation

Description: Shipboard field trials require significant preparations because: (a) There is no opportunity to “go to back to the shop” to get broken or forgotten supplies. (b) Ship’s commercial rates typically ranging between \$40,000 and \$80,000 per day. This requires equipment to be ready to go and integrated with operations such that it does not delay the ship. Equipment preparation specifically includes:

- Logistics Preparation:
 - Team Coordination: Sampling Team, Dosing Team, Ship Personnel, Ship Office Personnel
 - Finalize Test Protocol
 - Develop, Print, Bind Field Logs
 - Obtain Ballast Water Discharge Permit(s).
 - Team Travel and Accommodation Arrangements
 - Purchasing and administrative preparations
- Equipment Preparation:
 - Sampling and Measurement
 - Dye Sampling Equipment Rental and Set-up
 - Pressure Transducer Suite Set-up
 - Ship Dynamics Measurement Suite Set-up
 - Mixing Equipment
 - Dye Stock and Dosing Equipment Set-up
 - Air Lift Equipment Set-up
 - Eductor Equipment Set-up
 - Consumables Procurement
 - Shipment and Handling of Equipment to Ship Location

Summary Budget Information for Result 1: Trust Fund Budget: \$ 39,829
Amount Spent: \$ 39,829
Balance: \$ 0

Deliverable	Completion Date	Budget
1. Summary-Personnel	15 May 2010	\$4,770
2. Summary- Contracts	15 May 2010	\$17,475
3. Summary-USGS-Leetown Science Center	15 May 2010	\$2,065
4. Summary-Supplies	15 May 2010	\$15,519

Result Completion Date: 15 May 2010.

Result Status as of 1 June 2010: **RESULT 1 COMPLETED.**

Result Status as of 1 December 2010: **RESULT 1 COMPLETED.**

Result Status as of 1 June 2011: Project Completed

Final Report Summary:

Logistics and equipment preparations performed and complete, ready for ship trials.

The three groups: eductor team, air lift team, and sampling team, responsible for set-up and execution of the on ship testing completed preparations for the on ship trials in a timely fashion. Planning took place during weekly teleconferences where each of the three teams gave status updates. Communication with the ship's owner was ongoing during the planning process and their comments/concerns were answered and communicated to the teams. The majority of the required equipment was purchased or rented in advance and was loaded onto the ship approximately 1 week before the testing teams arrived in Duluth, MN.

The remainder of the equipment and consumables were delivered to the ship with the crew. The ships grocery supplier was utilized to help with transferring equipment to the ship during cargo loading at Two Harbors, MN. The teams arrived and boarded the vessel with all equipment on time 15 May 2010.

Result 2: Field Deployment

Description: Field deployment is the effort required to execute the actual work on board the ship. There are significant set-up and break-down efforts on board the ship such that the testing methods are ready for execution when the ship actually takes on the ballast water.

Summary Budget Information for Result 2: Trust Fund Budget: \$ 64,519
Amount Spent: \$ 64,519
Balance: \$ 0

Deliverable	Completion Date	Budget
1. Summary-Personnel	23 May 2010	\$10,075
2. Summary- Contracts	23 May 2010	\$35,018
3. Summary-USGS-Leetown Science Center	23 May 2010	\$15,800
4. Summary-Travel	23 May 2010	\$3,626

Result Completion Date: 23 May 2010

Result Status as of 1 June 2010: RESULT 2 COMPLETED.

Result Status as of 1 December 2010: RESULT 2 COMPLETED.

Result Status as of 1 June 2011: Project Completed

Final Report Summary:

Field deployment, including demobilization efforts, performed and complete.

The teams boarded the ship 15 May 2010 and disembarked 23 May 2010. Equipment was installed in the ballast tanks, the conveyor tunnel and on deck between 15 May and 17 May with all setups tested before closing of manhole accesses. The ship took on ballast in Gary Harbor Indiana the night of 17 May and testing commenced the morning of 18 May as the ship left port. Testing continued almost nonstop until the ship arrived in Superior, Wisconsin on 20 May. Discharge monitoring and harbor dilution studies were conducted while the ship was loading cargo the night of 20 May. The ship made an additional stop in Superior, WI to offload equipment requiring a crane to lift after cargo operations were completed. The test teams entered the empty ballast tanks after the ship exited Duluth Harbor the morning of 21 May to remove all equipment. Equipment was all removed, cleaned, and stowed on deck by the afternoon of 23 May. All remaining testing personnel disembarked ship at the Sault St. Marie Locks the afternoon of 23 May. The remaining equipment on board the ship will be offloaded the next time they make a Superior, WI port call.

Result 3: Data Analysis/Report

Description: Project completed

Summary Budget Information for Result 3: Trust Fund Budget: \$ 20,651
Amount Spent: \$ 20, 651
Balance: \$ 0

Deliverable	Completion Date	Budget
1. Summary-Personnel	15 Sept 2010	\$3,154

Result Completion Date: 30 June 2011.

Result Status as of 30 June 2011: Project completed

Final Report Summary:

V. TOTAL TRUST FUND PROJECT BUDGET: \$125,000

Personnel: \$ 17,999

Contracts: \$ 69,990

USGS-Leetown Science Center: \$17,865

Equipment/Tools/Supplies: \$ 15,519

Travel: \$ 3,626

TOTAL TRUST FUND PROJECT BUDGET: \$125,000

Explanation of Capital Expenditures Greater Than \$3,500: NONE

VI. PROJECT STRATEGY:

A. Project Partners:

1. USGS Western Fisheries Research Center (WFRC). As the primary contract for the grant, the Center will receive no indirect costs for implementing this research. The WFRC has agreed to cost-share the indirect costs of this project by paying for these expenses out of other budgets. The indirect costs absorbed by the WFRC amount to \$42,000.
2. USGS Leetown Science Center. The center will receive \$17,865 to cover efforts to develop the air lift methods, staff time, and travel to the ship for field trials.
3. A marine engineering firm. The marine engineering firm selected by the WFRC through a competitive process will perform as a contractor and receive \$69,990. This will cover overall logistical coordination of the testing efforts, including dye dosing and sampling preparation, execution, and reporting upon completion of the effort.
4. National Park Service, Isle Royal. NPS will not receive any funding. However, NPS will be obtaining critical discharge permits, as well as supply needed on-site support efforts in the Great Lakes. Additionally, NPS will serve as the "customer" by both providing feedback real time as field efforts are progressing, and be a recipient of the results of the study.

B. Project Impact and Long-term Strategy:

Ballast water is the primary pathway for aquatic invasive species (AIS) introduction and spread to the Great Lakes and Lake Superior. At least one new invasive species is found in the Great Lakes each year. Many ballast water treatment technologies are currently undergoing research, development and various regulatory approvals. International, national and state laws are being established to mandate the use of ballast treatment; however it will be many years before effective ballast treatment devices are available or required for all vessels. Lake Superior will remain at risk for new AIS for many years unless simple cost effective emergency treatment is developed, especially for high risk vessels. High risk vessels include those that frequent Great Lakes ports with known infestations or active outbreaks of AIS. For example, viral hemorrhagic septicemia (VHS) has not been found in Lake Superior, but ships that take up ballast water in areas where there is an outbreak of VHS and then discharge untreated ballast water into Lake Superior may pose a high risk. Development of methods to treat ballast water in high risk vessels would substantially reduce the risk of spreading VHS and other AIS to Lake Superior.

This study would build on existing efforts to reduce risks of introducing and spreading AIS through ballast water. An ongoing investigation at the Great Ships Initiative is bench testing the efficacy of active substances such as chlorine to treat ballast water. At the same time, other researchers are developing methods to identify high risk ports in the Great Lakes. This study will field test several emergency treatment methods in the absence of installed metering systems, including powered mixing devices and administering a biocide directly through the access ports. The methods must include protocols to ensure an environmentally sound discharge. The methods should also be practical for deployment on any vessel, economical, and cause minimal delays in the vessels' schedule.

C. Other Funds Proposed to be spent during the Project Period:

This project is Phase III of a planned IV to achieve final project results. At the end of each successive phase, we are advancing the best practices for emergency ballast water treatment. As such, each phase is valuable in isolation – and each phase builds upon the results of the last.

Efforts which have been completed or are in progress to complement this \$125,000 grant for Phase III:

- Phase I – Study Planning. Funding Agency NOAA - \$25,000. Completed.
- Phase II – Passive Mixing Field Trials. Funding Agency Great Lakes Fisheries Trust - \$185,000. In progress, 80% complete.
- Phase III – This proposal.
- Phase IV – Finalizing Novell Methods. Funding Agency USGS – TBD. Proposal under development.

- Significant in-kind financial contributions have been made by the NPS, and the USGS-WFRC through proposal preparation efforts and during phases I, II and III.

D. Spending History: See “C” above.

VII. DISSEMINATION:

The focus of the effort is to provide practical guidance for handling high risk ballast water to emergency responders. The outcome will be the incorporation of these methods (if determined to be effective and practical) into a best practices guide for treating the ballast water of ships either:

- Arriving in port with high risk ballast water,
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Progress

– Preliminary information from Result 1 and Result 2 activities were shared at the May 18, 2010 Great Lakes Ballast Water Collaborative meeting in Montreal, QC and at the June 1, 2010 Lake Superior Binational Program - Invasive Species Workshop in Duluth, MN.

- The final project results consisting of two reports entitled “Emergency Response Guidance for Handling Ballast Water to Control Aquatic Invasive Species” and “Mixing Biocides into Ship’s Ballast Water—Great Lakes Bulk Carrier Field Trials” are posted on the National Park Service web site at <http://www.nps.gov/isro/naturescience/handling-ballast-water-to-control-non-indigenous-species.htm>

VIII. REPORTING REQUIREMENTS: Project completed

IX. RESEARCH PROJECTS: N/A

Attachment A: Budget Detail for 2009 Projects - Summary and a Budget page for each partner (if applicable)											
Project Title: <i>Emergency Delivery System Development for Disinfecting Ballast Water</i>											
Project Manager Name: <i>Scott Smith.</i>											
Trust Fund Appropriation: \$125,000											
1) See list of non-eligible expenses, do not include any of these items in your budget sheet											
2) Remove any budget item lines not applicable											
2009 Trust Fund Budget	Result 1 Budget:	Amount Spent (date)	Balance (date)	Result 2 Budget:	Amount Spent (date)	Balance (date)	Result 3 Budget:	Amount Spent (date)	Balance (date)	TOTAL BUDGET	TOTAL BALANCE
BUDGET ITEM	Logistics and Equipment Preparation			Field Deployment			Data Analysis/Report				
PERSONNEL: wages and benefits	9,575			13,706			9,969		0	33,250	0
Noah Adams (\$62.21 per hour - Loaded rate) 40 hrs Logistics, 88 hrs Field Deployment, 80 hrs Data Analysis (Estimated \$12,940)											
Gary Rutz (\$34.41 per hour - Loaded Rate) 40 hrs Logistics, 88 hrs Field Deployment, 40 hrs Data Analysis (Estimated \$5,781)											
Marshal Hoy (\$23.12 per hour -Loaded Rate) @ 80 hrs field deployment, 80 hrs data analysis. (Estimated \$3,670)											
Scott Smith (\$63.50 per hour - Loaded Rate) 28 hrs Logistics, 6.8 hrs field deployment, 28 hrs data analysis) (Estimated \$3,999)											
Carolyn Brill, Administrative Officer (.013 FTE \$750) Logistics, (.013 FTE \$750) Field Deployment (Estimated \$1,500)											
Staci Clark, Budget Analyst (.026 FTE \$1250) Logistics, (.026 FTE \$1250) Field Deployment (Estimated \$2,500)											
Libby Pierce, Purchasing Agent (.015 FTE \$500) Logistics, (.015 FTE \$500) Field Deployment (Estimated \$1,000)											
Roy Dodson, Shop Manager (.024 \$1000) Logistics (Estimated \$1,000)											
Melonie Skinner, DOI Fiscal Analyst, (.1 FTE \$430) Logistics, (.1 FTE \$430) Field Deployment (Estimated \$860)											
Contracts											
Professional/technical services from a marine engineering firm will be selected by the WFRC through a bid process	22,955			29,803			17,242		0	70,000	0
Other contracts (with whom?, for what?) list out: personnel, equipment, etc.											
Other direct operating costs (for what? – be specific)	225			3,991						4,216	0
Equipment Shipping costs to & from test site (Estimated \$225)											
Diesel Air Compressor (rental, del, return) (Estimated \$2,891)											

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	Logistics and Equipment Preparation			Field Deployment			Data Analysis/Report				
High Pressure Air Line Hose (rent,del, return) (Estimated \$1,100)											
Non-capital Equipment / Tools (what equipment? Give a general description and cost)	7,074									7,074	0
Airline manifolds (2) (Estimated \$1,370)											
Air Flow Meters (6) (Estimated \$1,700)											
Control Valves (8) (Estimated \$300)											
Pressure gages (6) (Estimated \$180)											
Airlift eductor piping (Estimated \$2,100)											
Suction Line tubing (Estimated \$1,174)											
Support brackets (Estimated \$250)											
Supplies (list specific categories)				5,040					0	5,040	0
Rental of Water inductors (Estimated \$1,000)											
Purchase of 1.5 inch hose, connectors, and mounting hardware for hose (Estimated \$1,445)											
Purchase of mounting hardware for inductors (Estimated \$1,580)											
Data collection/storage devices and data storage (Estimated \$265)											
Diesel Fuel for air compresor (Estimated \$750)											
Travel expenses in Minnesota (hotel, perdiem, parking, taxie)				500					0	500	0
Travel outside Minnesota (where?, for what purpose?)				4,920					0	4,920	0
Travel for Dr. Watten from duty station (W.VA) to Superior WI (Estimated \$1,100)											
Travel from Cook to Deluth for Noah (airfair, parking, taxie) (Estimated \$1,230)											
Travel from Seattle to Deluth for Marshal (airfair, parking, taxie) (Estimated \$1,260)											
Travel from Cook to Deluth for Gary (airfair, parking, taxie) (Estimated \$1,330)											
Other (Describe the activity and cost) <i>be specific</i>											
COLUMN TOTAL	\$39,829	\$0	\$39,829	\$57,960	\$0	\$57,960	\$27,211	\$0	\$0	\$125,000	\$0