Environment and Natural Resources Trust Fund (ENRTF)
2010 Work Program

Date of Report:
Date of Next Progress Report:
Date of Work Program Approval:
Project Completion Date: June 30, 2013

I. PROJECT TITLE: Bioacoustic Traps for Management of Round Goby

Project Manager: Allen F. Mensinger
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Location: *The Duluth-Superior Harbor and Lower St. Louis River, St. Louis County, Carlton County, Duluth*

Total ENRTF Project Budget:	**ENRTF Appropriation**	**$ 175,000**
	Minus Amount Spent:	**$ 0**
	Equal Balance:	**$ 175,000**

Legal Citation: M.L. 2010, Chp. 362, Sec. 2, Subd. 6d

Appropriation Language:
$175,000 is from the trust fund to the Board of Regents of the University of Minnesota to evaluate bioacoustic technology specific to invasive round goby in Lake Superior as a method for early detection and population reduction. This appropriation is available until June 30, 2013, by which time the project must be completed and final products delivered.

II. PROJECT SUMMARY AND RESULTS:

The round goby is an invasive fish that is rapidly spreading throughout the Great Lakes. It outcompetes native fish and is negatively impacting the benthic fish community. Its ability to spawn throughout the spring and summer in contrast to native fish, which only spawn once per year, is one reason for its success. Therefore, by interfering with the gobies' reproductive cycle, its expansion would be stopped or delayed. As male gobies use sound to attract females to the nest, we plan to develop a bioacoustic fish trap to capture female round gobies throughout the spawning season. We will first develop a sound library of the fish's calls to determine the correct calls to use. We will then test these sounds and different trap designs in a laboratory setting to optimize attraction and capture efficiency. Finally, we will deploy these bioacoustic traps in the Duluth - Superior Harbor to test their efficacy under field conditions. The technology could be used as an early warning system to alert fishery managers of new goby investigations, to block the spread of the goby at key check points, and potentially to eradicate new or small populations of the invasive fish.

III. PROGRESS SUMMARY AS OF:

IV. OUTLINE OF PROJECT RESULTS*:*

RESULT/ACTIVITY 1: Round Goby acoustic library

Description: Multiple hydrophones will be placed throughout the Duluth Superior Harbor to record the sounds of the round goby. As fish vocalizations may be temperature and seasonally dependent, it is important to have an entire spawning season (May through September) of sounds. This will allow the sounds to be adjusted throughout the season in future years to optimally attract female gobies.

Summary Budget Information for Result/Activity 1: **ENRTF Budget: $58000**
Amount Spent: $ 0
Balance: $ 58000

Deliverable/Outcome	Completion Date	Budget
1. An acoustic library of sounds emitted by the round goby in the field at various temperatures	6/30/2011	$58000

Result Completion Date: 6/30/2011

Result Status as of 12/31/2010:

Result Status as of 6/30/2011

Final Report Summary:

RESULT/ACTIVITY 2: Round goby sound attraction

Description: Underwater speakers will be placed in large (2 meter diameter) tanks in the laboratory. The round goby sounds (from result 1) will be played to female gobies. We will determine the optimal sound parameters (frequency, calling rate, amplitude) for round goby attraction.

Summary Budget Information for Result/Activity 2: **ENRTF Budget: $59000**
Amount Spent: $ 0
Balance: $ 59000

Deliverable/Outcome	Completion Date	Budget
1. Acoustic sound files of the best sounds to attract the round goby in the laboratory.	June 30, 2012	$59000

Result Completion Date: June 30, 2012

Result Status as of December 31, 2011

Result Status as of: June 30, 2012

Final Report Summary:

RESULT/ACTIVITY 3: Round goby bioacoustic traps

Description: Minnow traps will be modified into round goby bioacoustic traps that include an underwater speaker and large holding area. The traps will be placed throughout the Duluth-Superior Harbor and St. Louis River. Round goby sounds (result 2) will be played throughout the breeding season and the number female gobies captured will be compared to control traps (without sound).

Summary Budget Information for Result/Activity 3: **ENRTF Budget: $58,000**
Amount Spent: $ 0
Balance: $ 58,00

Deliverable/Outcome	Completion Date	Budget
1. To develop a fish trap that will attract the round goby via sound recording developed in the result 1 and 2.	June 30, 2013	$58000

Result Completion Date: June 2013

Result Status as of December 31, 2012:

Result Status as of June 30, 2013

Final Report Summary:

V. TOTAL ENRTF PROJECT BUDGET: ***175,000***

Personnel: $ 154,100

PI Allen Mensinger Has 9 month appointment at University of MN Duluth one month summer salary is requested for 3 summers 75% salary, 25% fringe	$ 35,000
graduate research assistant 50% time, 36 months, 58% salary, 42% tuition/fringe	$109,000
Undergraduate research assistant 3 month summer stipend (2 summers) 75% salary, 25% fringe	$10,600

Contracts: N/A

Equipment/Tools/Supplies: $ 18600

equipment	supplier	number	Cost per unit	Total
hydrophones	TBD	5	300	1500
speakers	Underwater sound	10	350	3500
amplifiers	WPI	2	300	600

Data acquisition systems	TBD	2	2500	5000
Fish traps	Aquatic Eco systems	20	~12	250
Supplies for making hydrophone stand, mounting speakers and modifying fish traps such as lumber, steel and PVC pipe	Home depot			2000
Gas for boat	various			1000
Electronics	Radio Shack			1000
Electronic storage device	Best Buy	1	250	250
Large aquaria	Red Ewald	2	500	1000
Water Chiller	Aquatic Eco systems	1	2000	2000
Test kits	Aquatic Eco systems			500
Total				$18,600

Acquisition (Fee Title or Permanent Easements): N/A

Travel: $ 1800

Travel by car with boat trailer to field sites. 2 spawning seasons (for sound library and traps). 80 miles rt per week. 20 weeks per year. @0.55/per mile

Additional Budget Items: $ N/A

TOTAL ENRTF PROJECT BUDGET: $ 175,000

Explanation of Capital Expenditures Greater Than $3,500: Data acquisition systems are $2500 each for a total of $5000. These are needed to record data and control the speakers

VI. PROJECT STRATEGY:

A. Project Partners: Professor Allen Mensinger of the University of Minnesota Duluth will supervise all aspects of the project. He is an expert on fish bioacoustics and will assemble the bioacoustic library and plan the sound experiments. He will train the graduate student to conduct the sound experiments, build the traps and complete the field trials. Undergraduate students will be recruited to assist with the summer experiments.

B. Project Impact and Long-term Strategy:

The overall goal of the project is to develop a bioacoustic trap for the capture of round gobies. If successful, the appropriate state agencies (ie DNR) will be provided with the traps/acoustical library to manage this invasive species. The trap is designed to be lightweight, portable and economical (~$300 per trap) for use by a wide range of interested parties. A reasonable estimate

at this time is that strings of 5 to 10 traps could be used to block upstream migration in rivers or streams and/or sample small lakes.

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

The PI has a 9 month appt at UMD, that is divided approximately 50% research and 50% teaching. He will dedicate 2 months of academic year salary plus fringe per year as in kind support on the project for three years. Total $66,300

D. Spending History: The goby populations in the harbor and preliminary trapping has been conducted over the last several years. Mensinger has used University funds to pay the summer salary of two graduates students for a total of three summers. Approximately $20K has been expended in this preliminary research

VII. DISSEMINATION:

All the results of the study will be published in peer reviewed publications. The round goby sound library will be placed on the PI's (Mensinger) web site and will be available for free download. Mensinger and the graduate student will present the results at the appropriate state, regional and national meetings. Mensinger also will be available to consult (at no charge) for the appropriate end users of this technology such as local, state and federal agencies including the MN DNR for the duration of the grant. Appropriate end users will also be offered the opportunity to purchase the traps from the PI for the cost of production.

VIII. REPORTING REQUIREMENTS: Periodic work program progress reports will be submitted not later than _____. A final work program report and associated products will be submitted between June 30 and August 1, 2011 as requested by the LCCMR.

IX. RESEARCH PROJECTS: See research addendum.

Attachment A: Budget Detail for 2010 Projects - Summary and a Budget page for each partner (if applicable)

Project Title: Bioacoustic traps for the management of the round goby

Project Manager Name: Allen Mensinger

Trust Fund Appropriation: $ *175000*

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

2010 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)*	**Result 4 Budget:**	**Amount Spent** *(date)*	**Balance** *(date)*
	Round goby acoustic library	*12/16/2009*	*12/16/2009*	*Round Goby Sound Attraction*	*12/16/2009*	*12/16/2009*	*Round goby bioacoustic traps*	*12/16/2009*	*12/16/2009*	*Dissemination/publication of results*	*12/16/2009*	*12/16/2009*
BUDGET ITEM												
PERSONNEL: wages and benefits PI-Allen F. Mensinger, PhD (nine month appointment at UMD) requesting a total of 3 months summer	9,600	0	9,600	9,700	0	9,700	9,700	0	9,700	6,000	0	4,000
Elise Cordo - Masters student 24 months support	30,000	0	30,000	34,000	0	34,000				8,000	0	8,000
Graduate student - to be determined 12 months support							34,000	0	34,000	3,000	0	3,000
Undergraduate research assistant - to be named - 6 months support (summer only)	3,000	0	3,000	4,500	0	4,500	3,100	0	3,100			
Capital equipment over $3,500 two data acquisition systems are requested @ $2500	5,000	0	5,000									
Supplies *(list specific categories)*												
hydrophones	1,500	0	1,500									
speakers				1,000	0	1,000	2,500	0	2,500			
amplifiers				300	0	300	300	0	300			
fish traps	250	0	250									
lumber, pipes, hardware supplies for modifying fish traps	500	0	500				1,500	0	1,500			
gasoline for boat	500	0	500				500	0	500			
electronic supplies (cables, wire)	500	0	500				500	0	500			
electronic storage device	250	0	250									
Large Aquaria				1,000	0	1,000						
Water chiller				2,000	0	2,000						
Water test kits				500	0	500						
Travel expenses in Minnesota travel to field sites	900	0	900				900	0	900			
Travel outside Minnesota if necessary some of the above field site travel may take place on the wisconsin side on the St. Louis River												
COLUMN TOTAL	**$52,000**	**$0**	**$52,000**	**$53,000**	**$0**	**$53,000**	**$53,000**	**$0**	**$53,000**	**$17,000**	**$0**	**$17,000**