Environment and Natural Resources Trust Fund
2009 Phase 2 Request for Proposals (RFP)

LCCMR ID: 089-C1

Project Title: Heating of Sediment to Eradicate Purple Loosestrife Seeds

Total Project Budget: $ $280,000

Proposed Project Time Period for the Funding Requested: 2 years; Fall 2009 to Fall 2011

Other Non-State Funds: $ $0.00

Priority: C1. Aquatic and Terrestrial Invasive Species

First Name: Lawrence **Last Name:** Zanko

Sponsoring Organization: U of M, NRRI

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Region:	County Name:	City / Township:
NE	St. Louis	

Summary: The purpose of this project is to evaluate the potential of a new management tool that would use electrical and microwave technologies to heat sediment and kill purple loosestrife seeds.

Main Proposal: 1008-2-048-proposal-2009_main_proposal_template_Purple_Loosestrife_ver1 NRR

Project Budget: 1008-2-048-budget-RFP_2009_Project Budget-Purple_Loostrife NRRI EGG.xls

Qualifications: 1008-2-048-qualifications-2009 LCCMR Project Manager Qualitifications NRRI

Map:

Letter of Resolution:

MAIN PROPOSAL

Heating of sediment to eradicate purple loosestrife seeds.

I. PROJECT STATEMENT

The purpose of this project is to evaluate the potential to use electrode and microwave technologies as management tool to kill purple loosestrife seeds in sediment. Management of the spread of purple loosestrife begins with eradicating the seeds so that the noxious weed can not spread and infest new wildlife habitat. Areas of purple loosestrife infestation are found in areas of the St. Louis River Estuary and seeds can end up in dredge material from the Harbor.

Erie Pier, a confined disposal facility (CDF) for dredge sediment from the St. Louis River, is approaching its present design capacity, estimated to be reached in 5-10 years. Maintenance dredging of the Federal Navigation Channel in the Duluth – Superior harbor can add approximately 100,000 cubic yards to the CDF annually. Only a small fraction of this material is currently recycled. Purple loosestrife seeds were identified in the sediment during a 2007 study. The presence of purple loosestrife requires that sediment removed from the CDF be permitted under Minnesota's Noxious Weed Law and Rules. In order for the sediment to be recycled, management practices for controlling purple loosestrife need to be developed. And management tools that destroy the plant seeds prior to moving sediment to another locality would reduce the potential for the plant to migrate to off site locations.

Based on laboratory testing conducted at NRRI, seeds heated to 200° F for approximately ½ day are not viable. Purple loosestrife seeds germinate when heated to 55° F for a period of 3 days. A series of bench scale tests would be conducted to evaluate the feasibility of in-situ heating of dredge sediment containing purple loosestrife seeds from the St. Louis River. Sediment and seed mixes will be heated by both electrical technologies and portable microwave generator to produce heat high enough to promote winter time seed germination. Once the temperature of germination is achieved the heat source will be removed and the seed will be exposed to winter temperatures which should kill it.

II. DESCRIPTION OF PROJECT RESULTS

Result 1: Seed Collection and Sample Preparation **Budget: $** 50,000
Activities: collect purple loosestrife seeds from dredge sediment from Erie Pier. Samples will be collected from several transects and at depths reported to contain the seeds. Seed viability will be tested. Separate samples into 3 groups, 2 technology and 1 control. Construct test cells for study.

Deliverable	Completion Date
1. Collect purple loosestrife seeds	Summer/Fall 2009
2. Test viability of seeds & split samples	Fall 2009
3. Construct test cells	Fall 2009

Result 2: Evaluation of Electric Technology **Budget: $** 80,000
Activities: Samples of sediment containing purple loosestrife seeds will be placed in constructed wetlands and uplands. Various heating temperatures, heating times, and cooling temperatures will be applied to determine the most effective methods using electric technologies. Heat is applied to promote germination and cold for elimination of purple loosestrife seeds. Some control group samples will be allowed one year growing time so that plants and seeds are present. These samples will then be subjected to the best heating and cooling regime to verify destruction of the plant.

Deliverable	Completion Date
1. Optimum temperature and time	Winter 2009

method determination - seeds

2	2nd year evaluation of technology with plant and seed destruction rate	Winter 2010

Result 3: Evaluation of Portable Microwave Technology **Budget: $** 80,000

Activities: Samples of sediment containing purple loosestrife seeds will be placed in constructed wetlands and uplands. Freshly germinated seeds will be subjected to various heating temperatures and heating times will be applied to determine the most effective methods using microwave technology. Heat is applied to promote germination and cold for destruction of purple loosestrife germinated seeds. Some control group samples will be allowed one year growing time so that plants and seeds are present. These samples will then be subjected to the best heating and cooling regime to verify destruction of the plant.

Deliverable	**Completion Date**
1. Optimum temperature and time method determination - seeds	Winter 2009
2 2nd year evaluation of technology with plant and seed destruction rate	Winter 2010

Result 4: Data Compilation, Technology Comparison and Reporting **Budget: $** 70,000

Activities: Compile all data generated by the study, compare the technologies for effectiveness, provide methodology for field scale testing of the technology(ies). All data, results and recommendations will be presented in a final report.

Deliverable	**Completion Date**
1. Data compilation	Spring 2011
2. Final report with recommendations for field scale test methods	Fall/Winter 2011

III. PROJECT STRATEGY AND TIMELINE

A. Project Partners

Our project team includes: Larry Zanko, NRRI, overall project management, sample collection, and sample testing; Seppo Valppu, botanist/purple loosestrife expert, determine effectiveness of technologies; and Ken Wittle, ElectroPetroleum, electric technology, and David M. Hopstock & Associates, microwave technology.

B. Project Impact

This project expects to determine the effectiveness of applying heat by electric or portable microwave technology to sediment to eradicate purple loosestrife seeds contained in the sediment. Application of this technology could then allow sediment from the St. Louis River to be transported to other locations in Northeastern Minnesota without the potential to spread the invasive purple loosestrife.

C. Time

2.5 years will be required for this study. The first year will investigate the best methods for applying the electric or microwave technologies to just seeds in sediment. For the second year, both technologies will be applied to some control group samples where the seeds have been allowed to germinate, flower, and produce seeds, to go through a season of growth. Funding requirements are $280,000 to test both technologies for 2.5 years.

D. Long-Term Strategy (if applicable)

If one or both of these technologies are seen to kill purple loosestrife at bench scale testing, the next phase of the investigation would be to complete a field demonstration. The field project would use purple loosestrife and native plants to evaluate the use of the technology both at dredge facilities and in natural environments with mixed plant populations

Project Budget

Heating of sediment to eradicate purple loosestrife seeds.

IV. TOTAL PROJECT REQUEST BUDGET

BUDGET ITEM	AMOUNT	% FTE
Personnel: Project Manager (LZ) includes salary and benefits - 2 years	$ 35,000	20%
Scientist (MP) - 2 years	$ 50,000	30%
Technician - 2 years	$ 37,000	30%
Contracts: Purple Loosestrife Expert - Seppo - 2 years	$ 50,000	
Electo Petroleum - electric technology - 2 years	$ 50,000	
Dave Hopstock & Associates - microwave technology - 2 years	$ 50,000	
Equipment/Tools: Materials for test cells (containers, moisture probes, temperature probes, etc), sample collection tools (shovels, bags, screens, gloves, etc.)	$ 8,000	
Acquisition (Including Easements):	$ -	
Restoration:	$ -	
Other:	$ -	
TOTAL PROJECT BUDGET REQUEST TO LCCMR	$ 280,000	

V. OTHER FUNDS

SOURCE OF FUNDS	AMOUNT	Status
Remaining $ From Previous Trust Fund Appropriation (if applicable): *How much Trust Fund money remains not spent or legally obligated from any previous Trust Fund appropriation for any directly related project of the proposing project, project manager, or project organization? Specify the appropriation.*	$ -	*Unspent or Not Legally Obligated*
Other Non-State $ Being Leveraged During Project Period: *What additional non-state cash $ will be spent on the project during the funding period? For each individual sum, list out the source of the funds, the amount, and indicate whether the funds are secured or pending approval.*	$ -	*Secured or Pending*
Other State $ Being Spent During Project Period: *What additional state cash $ (e.g. bonding, other grants) will be spent on the project during the funding period? For each individual sum, list out the source of the funds, the amount, and indicate whether the funds are secured or pending approval.*	$ -	*Secured or Pending*
In-kind Services During Project Period: *What in-kind services will be provided during the funding period? List type of service(s) and estimated value. In-kind services listed should be specific to the project.*	$ -	
Past Spending: *List money spent or to be spent on this specific project, cash and/or in-kind, for 2-year timeframe prior to July 1, 2009*	$ -	

2009 LCCMR Project Manager Qualifications

Larry Zanko - NRRI
Mr. Zanko is a research fellow in the Economic Geology Group at the Natural Resources Research Institute (NRRI), based at the University of Minnesota Duluth. He has worked in the minerals field and has conducted geological, mineral resource and minerals industry-related applied research for most of his 26-year career. Since his start with NRRI in 1988, he has worked on a broad spectrum of research projects, often conducted in cooperation with private industry, dealing with non-ferrous minerals, ferrous minerals, industrial minerals (most recently focusing on construction aggregates), contaminated sediment remediation and reuse, and related policy issues. He regularly interacts and collaborates with public and private sector professionals and academicians in the minerals, transportation, and environmental fields, inside and outside Minnesota. He is a graduate of the University of Minnesota – Twin Cities, where he received bachelor degrees in Geological Engineering and Microbiology, and a Masters degree in Geological Engineering.

Since 2000, Mr. Zanko has also worked on projects related to the remediation and beneficial reuse of contaminated and uncontaminated sediment and soil, experience that is particularly relevant to this proposal to LCCMR. Project collaborators have included the U.S. Army Corps of Engineers (Detroit District and Duluth Area Office) via the United States Environmental Protection Agency; state agencies; local entities like the Duluth Seaway Port Authority; and the private sector. Much of this work has focused on evaluating innovative technologies related to soil, sediment, and water cleanup.

Project Partners

Seppo Valppu
Botanist and purple loosestrife expert/consultant. Will assess and determine effectiveness of technologies on preventing seed germination.

Ken Wittle, PhD.
ElectroPetroleum, Inc. (EPI). The project will incorporate electrical technology developed by EPI and utilize the expertise of EPI staff.

David M. Hopstock, PhD
David M. Hopstock & Associates, LLC, will provide microwave technology expertise, safety guidance, and microwave technology development.