

**Environment and Natural Resources Trust Fund  
2011-2012 Request for Proposals (RFP)**

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**LCCMR ID: 070-C1+2**

**Project Title:** Recycling Sediments to Enhance and Restore Marginal Lands

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**Category:** C1+2. Protection, Restoration, and Enhancement

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**Total Project Budget:** \$ \$499,750

**Proposed Project Time Period for the Funding Requested:** 3 yrs, July 2011 - June 2014

**Other Non-State Funds:** \$ 0

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**Summary:**

How to enhance/restore about 50 acres of non-productive mine and non-mining lands every year using clean recycled sediments removed from the St. Louis River estuary: a demonstration and evaluation project.

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**Name:** Lawrence Zanko

**Sponsoring Organization:** U of MN - NRRI

**Address:** 5013 Miller Trunk Hwy  
Duluth MN 55811-1442

**Telephone Number:** 218-720-4274

**Email:** lzanko@nrri.umn.edu

**Web Address:** \_\_\_\_\_

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**Location**

**Region:** NE

**Ecological Section:** Southern Superior Uplands (212J), Western Superior Uplands (212K), Northern Superior Uplands (212L), No. Minnesota Drift and Lake Plains (212N)

**County Name:** Carlton, Itasca, St. Louis

**City / Township:** n/a

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

# 2011-2012 MAIN PROPOSAL

**PROJECT TITLE:** Recycling Sediments to Enhance and Restore Marginal Lands

## I. PROJECT STATEMENT

The project will demonstrate and evaluate how clean navigation channel sediments annually removed from the St. Louis River estuary and placed at the Erie Pier sediment storage facility in Duluth can be reused (recycled) to enhance and restore the productivity of non- and/or low-productivity marginal lands such as mining lands. The project will take place primarily in the St. Louis River watershed of northern Minnesota, where hundreds to thousands of acres of these land types exist within 60 miles of Erie Pier (see attached illustrations). If this project has positive outcomes, it is estimated that **about 50 acres of other marginal forest and crop/pasture lands and mine lands within and near the St. Louis River watershed could be similarly improved/restored per year.** Project goals include demonstrating:

- Enhancement of sterile to marginally productive mine and non-mine lands, forestry enhancement, wetland creation, native species enhancement, improved biomass crop productivity, erosion/dust control via improved vegetative cover, and CO<sub>2</sub> sequestration.

To achieve these goals, up to 50 acres of disturbed, sterile, nutrient-poor, and low-productivity mining lands will be the project's focus. Activities will include:

- Site characterization, sediment placement strategies, plant species selection, growth monitoring, soil characterization (nutrient studies/chemistry/mineralogy), water quality, ecological/biological assessments, invasive species monitoring and mitigation;
- Assessing the effect of incorporating sediment at depths from 0.5 to 3 feet in a variety of site/soil conditions (wetland to upland; sterile to marginally productive; lower to higher pH) and with a variety of plant species (native to hybrid biomass; herbaceous to woody);
- Identification of and GIS mapping of other marginal land locations throughout the watershed area for future sediment applications; transportation logistic/economics.

The navigation channel sediments of interest (a blend of sands, silts, clays, and organic matter) are products of natural erosional processes that have been occurring for thousands of years in the St. Louis River watershed, yet only a fraction of these clean (tested) materials are reused/recycled following their removal and placement at Erie Pier. **The U.S. Army Corps of Engineers (USACE) has committed to provide and transport 40,000 to 80,000 yd<sup>3</sup> of these sediments from Erie Pier to one or more unproductive and/or disturbed mine lands, beginning in the latter half of 2010/early 2011; to be placed/spread by the participating mine(s).** This commitment provides NRRI with an immediate and unprecedented research opportunity to proactively influence, study, and monitor the soil-enhancing and plant/biomass growth potential of these materials under a variety of site conditions and settings at scales analogous to what could occur in the future, i.e., 5 to 50 acres per site per year.

## II. DESCRIPTION OF PROJECT ACTIVITIES

**Activity 1:** Review/Work Plan/Site Characterization/Species Selection (2011-2012; 12 months)

**Budget:** \$ 160,000

Outcome	Completion Date
1. Review previous site work history, visit sites, and develop work plans at recipient sites based on site conditions and intended end-uses.	September 2011
2. Site characterization and field work/sampling; biological/ecological survey(s); physical, mineralogical, chemical, and nutrient/fertility characterization testing of sediments; site soil and water quality analyses	December 2011
3. Species recommendation, selection, and propagation at NRRI	March 2012
4. Year 1 progress report	June 2012

**Activity 2:** Establish test plots, supplemental site work, begin GIS work, and conduct plant and soil site monitoring/testing (2012-2014; 27 months) **Budget:** \$ 240,000

Outcome	Completion Date
1. Establishment of test plots and initial GIS mapping product	Spring 2012
2. Year 2 progress report (findings to date) & host interim meeting	June 2013
3. Quantitative assessment of sediment's impact on species growth	Fall 2013
4. Ongoing site monitoring, surveys, and testing, including monitoring for and mitigation of potential invasive species will build project database	March 2014

**Activity 3:** GIS product, transportation/economic study, final report **Budget:** \$ 95,000

Outcome	Completion Date
1. Identify potential sites for future sediment usage throughout St. Louis River Watershed, mine and non-mine land, and build GIS product	December 2013
2. Based on an assessment of the 2010-11 material movement costs, modes of transportation used, and existing transportation network in the study area, perform an economic analysis that is linked to the GIS product	March 2014
3. Compile data from Activity 3 and complete GIS product	March 2014
4. Compile and interpret project outcomes; complete and publish a final report containing data from all activities	June 2014

**Activity 4:** Host an outreach meeting/workshop for stakeholders **Budget:** \$ 4,750

Outcome	Completion Date
1. Prepare/assemble/share project findings/recommendations with land owners and public/private sector stakeholders as a blueprint for the future.	Spring 2014

### III. PROJECT STRATEGY

#### A. Project Team/Partners

**NRRI Team (LCCMR funding):** Larry Zanko, Principle Investigator/Project Manager; Marsha Meinders Patelke, Co-PI, Geologist/Research Scientist; Bill Berguson, NRRI, Co-PI, Forest Products Program Manager; George Host, PhD, Co-PI, Center for Water and the Environment; Steve Hauck, Technical Review; and associated NRRI technical staff and students

**Partners (LCCMR funding):** Mineland Reclamation Specialist (TBD/MDNR); Soils and Native Plant Specialist (Kendall Dykhuis, St. Louis County Extension); Invasive Species Specialist (Seppo Valppu)

**Partners (Other/In-Kind):** U.S. Army Corps of Engineers (USACE); WLSSD; Duluth Seaway Port Authority; Taconite Mines. *NOTE: the USACE has notified NRRI that it will underwrite the loading and delivery of 40,000 to 80,000 cubic yards of sediment in 2010-11. At an estimated cost of \$20/yd, 50,000 cubic yards would translate into \$1million (a 2:1 value) for the project.*

#### B. Timeline Requirements

Three years are required for providing measurable outcomes; longer term (>3 years) work, i.e., field observations, measurements, sampling, analyses, etc., will likely be necessary to track growth progress post-project. Activity 1 will be completed in the first year (July 2011 – June 2012) of the project. Activities 2 – 4 will occur between March 2012 and June 2014.

#### C. Long-Term Strategy and Future Funding Needs

Project findings would be applicable to other areas around Minnesota and the Great Lakes region, including: tailings basins, gravel pits, brownfields, and other marginal lands. Key points of Minnesota Statutes 216B.1691 (renewable energy objectives) and 216H.02 (greenhouse gas emissions control) would also be addressed via increasing land productivity for biomass production. Additional funding may be requested/leveraged to continue site monitoring and/or follow-up testing of the concept at other locations, in cooperation with landowners and agencies.

## 2011-2012 Detailed Project Budget

### IV. TOTAL TRUST FUND REQUEST BUDGET 3 years

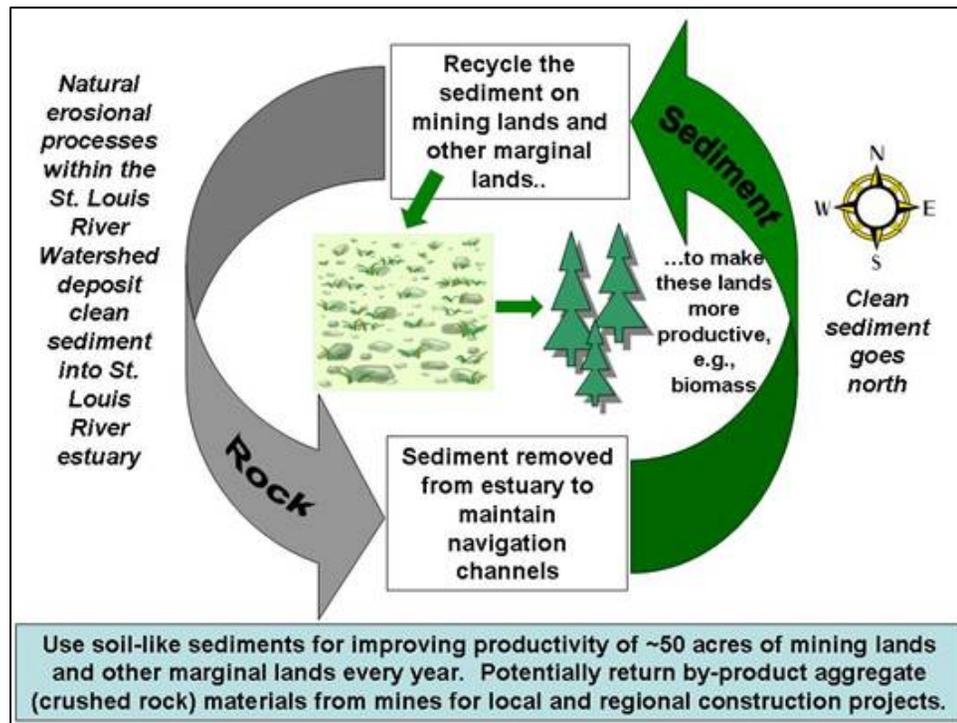
<u>BUDGET ITEM</u>	<u>AMOUNT</u>
<b>Personnel:</b> NRRI, Lawrence M. Zanko, PI (15% FTE: 66.7% salary, 33.3% fringe; 3 years): Overall project management, transportation and logistics/economics, mine site coordination, reporting	\$ 48,358
<b>Personnel:</b> NRRI, Marsha M. Patelke, co-PI (15% FTE: 59.9% salary, 40.1% fringe; 3 years): assistant project management and coordination with state, county, and local entities/stakeholders (public and private)	\$ 36,448
<b>Personnel:</b> NRRI Forest Products Group, (25% FTE: 65% salary, 35% fringe; 3 years): biomass species selection and planting, plot set-ups, monitoring; identification of potential non-mine land improvement candidates, reporting: FTE of 2-3 people combined, includes William E. Berguson, co-PI	\$ 94,461
<b>Personnel:</b> NRRI Center for Applied Research & Technology Development (50% FTE: 63.5% salary, 36.5% fringe; 3 years): Soil/sediment/water characterization, field work and lab assistance, technical review, GIS, and data compilation: FTE of 3-6 people combined, including students.	\$ 131,263
<b>Personnel:</b> NRRI Center for Water and Environment (20% FTE: 66.7% salary, 33.3% fringe; 3 years): Ecological/biological site assessments and GIS products: FTE of 2-3 people combined, includes George Host, co-PI	\$ 61,474
<b>TOTAL NRRI PROJECT PERSONNEL FOR 3 YEARS: \$372,004</b>	
<b>Contract #1:</b> Mineland reclamation specialist (TBD, MDNR)	\$ 10,000
<b>Contract #2:</b> Invasive species (e.g., purple loosestrife) specialist/botanist (Seppo Valppu)	\$ 25,000
<b>Contract #3:</b> Native species and soils restoration specialist/technical advisor (Kendall Dykhuis, St. Louis County Extension)	\$ 30,000
<b>Contract #4:</b> Sediment transport and placement for supplemental test sites, etc. (est. \$250 to \$500 per truckload)	\$ 7,500
<b>Contract #5:</b> External laboratory analyses of soils/sediments/water (TBD; likely more than one provider)	\$ 11,750
<b>Equipment/Tools/Supplies:</b> Supplies/tools for field studies	\$ 6,500
<b>Equipment/Tools/Supplies:</b> Soil/sediment/water characterization supplies and equipment; & sample shipping costs	\$ 8,996
<b>Equipment/Tools/Supplies:</b> Scanning Electron Microscope (SEM) lab time	\$ 2,500
<b>Travel:</b> Project vehicle(s) for field work and in-state meetings (based on ~40,000 miles of travel over 3 years @0.50/mile)	\$ 19,500
<b>Travel:</b> Lodging and meals (per diem) for in-state meetings and field work	\$ 6,000
<b>TOTAL ENVIRONMENT &amp; NATURAL RESOURCES TRUST FUND \$ REQUEST</b>	\$ 499,750

### V. OTHER FUNDS

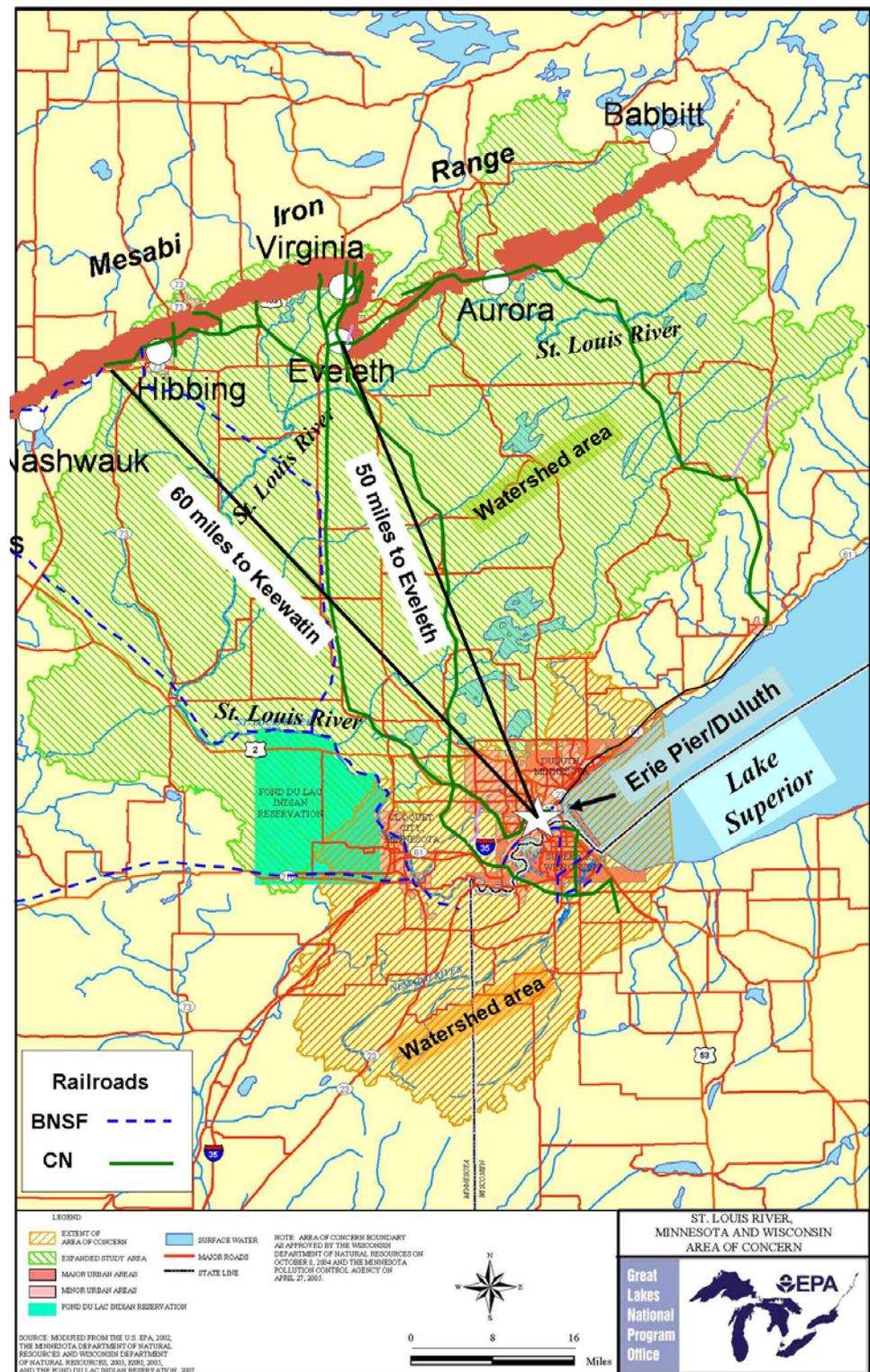
<u>SOURCE OF FUNDS</u>	<u>AMOUNT</u>	<u>Status</u>
<b>Other Non-State \$ Being Applied to Project During Project Period</b>	\$ -	NA
<b>In-kind Services During Project Period:</b> Sediment handling, loading, and transportation to demonstration location(s) will begin in late 2010/early 2011. These activities are critical for conducting the project and achieving its planned objectives: <b>ESTIMATED VALUE OF \$1,000,000</b>	\$ -	Secured
<b>In-kind Services During Project Period:</b> Sediment handling, spreading, and augmentation at the targeted mineland restoration/reclamation location(s): <b>Estimate is pending from participating mine(s)</b>	\$ -	Pending
<b>Funding History:</b>	\$ -	NA

**OBJECTIVE:** Demonstrate and evaluate how clean sediments removed from the St. Louis River estuary can be reused (recycled) to enhance and restore the quality and productivity of non-productive and marginal mine and non-mining lands.

**Responsible Resource Use Cycle Example**



Map source (modified by NRRI): [http://www.epa.gov/glnpo/aoc/stlouis/StLouis\\_Final\\_State\\_Approved\\_042007.pdf](http://www.epa.gov/glnpo/aoc/stlouis/StLouis_Final_State_Approved_042007.pdf)



## **Project Manager Qualifications and Organization Description**

### **Lawrence M. Zanko, Project Manager**

Mr. Zanko is a Research Fellow and Group Leader for By-Product Reuse and Remediation within the Minerals Division of the Center for Applied Research & Technology Development, University of Minnesota Duluth Natural Resources Research Institute (NRRI). He has worked in the minerals field and has conducted geological, mineral resource and minerals industry-related applied research for most of his 27-year career. He regularly interacts and collaborates with public and private sector professionals and academicians in the geological, minerals, transportation, and environmental fields, inside and outside Minnesota.

Since his start with NRRI in 1988, Mr. Zanko has participated in or led a broad spectrum of research projects dealing with non-ferrous minerals, ferrous minerals, industrial minerals (most recently focusing on construction aggregates), sediment remediation and reuse, and related policy issues. He and his NRRI colleagues, along with the University of Minnesota School of Public Health, are currently playing key research roles in the Minnesota Taconite Mine Workers Lung Health Partnership study.

For the past decade, Mr. Zanko has 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 (alone and 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 aimed at minimizing environmental impacts and maximizing resource use.

Mr. Zanko 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. He is a member of the Society for Mining, Metallurgy, and Exploration (SME); the Geological Society of America (GSA); and the Mineral Aggregates Committee of the Transportation Research Board (TRB).

### Project Responsibilities

Mr. Zanko's responsibilities as Project Manager/Principal Investigator will include: 1) overall project oversight; 2) budget management; 3) coordination of roles of project team members and collaborators; and 4) project reporting.

### **Organization Description: Natural Resources Research Institute (NRRI)**

NRRI was established in 1983. NRRI's mission is to foster economic development of Minnesota's natural resources in an environmentally sound manner to promote private sector employment.

Researchers/Scientists within NRRI's Center for Applied Research & Technology Development (CARTD) and Center for Water and the Environment (CWE) will play key project roles.