

**Environment and Natural Resources Trust Fund  
2014 Request for Proposals (RFP)**

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**Project Title:**

**ENRTF ID: 162-F**

Dredged Sediment for Forest Restoration on Unproductive Minelands

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**Category:** F. Methods to Protect, Restore, and Enhance Land, Water, and Habitat

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**Total Project Budget: \$** 495,585

**Proposed Project Time Period for the Funding Requested:** 4 Years, July 2014 - December 2017

**Summary:**

Restore up to 136 acres of unproductive mine stockpile while improving the treatment of municipal sewage and biosolids near Virginia using clean Erie Pier dredged sediment and managed forestry techniques.

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**Location**

**Region:** Northeast

**County Name:** St. Louis

**City / Township:** Virginia

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



## I. PROJECT STATEMENT

The intent of this project is to demonstrate improved, sustainable, and best-practices methods of mineland restoration then transfer this methodology elsewhere, to perpetuate dual benefits to the environment and local commerce.

**1. Background and Intent** – NRRI researchers began testing the dredged sediment from Erie Pier with the financial support of the USACOE and EDA in 2010 at sites in the Duluth area and at USS Keetac (tailings basin) and subsequently at Cliffs Hibtac (borrow pit) locations as a restoration substrate. Dredged sediment has not been tested on the unproductive mine stockpiles nor has it been used in conjunction with municipal waste treatment. Furthermore, Erie Pier dredged sediments have not been demonstrated as a substrate for enhanced and sustained productive forests.

**2. Justification** – Mine stockpiles are unproductive due to soil deficiencies of organic matter, nutrients and soil organisms, properties essential to support healthy plant growth, diversity and succession. Erie Pier sediment, with the addition of municipal effluent biosolids, compost, and dredged sediments – combined with proper selection of ecologically suitable plant materials – would address these deficiencies and accomplish the following: 1) beneficially build soils; 2) stabilize the site relative to erosion; 3) benefit wildlife habitat; 4) enhance biodiversity; 5) provide sustainable wood/biomass to local industries; 6) sequester carbon dioxide both in the regenerative growth and the replacement of fossil fuels by high productivity biomass; 7) demonstrate diversified commercial potential from restored sites with proper management; and 8) verify potential technology transfer to other restoration sites (e.g., brownfield sites) statewide.

**3. Materials and Methods** – The site (in kind) provided for this research by St. Louis County is 136 acres near Virginia. This site is designated for municipal effluent and biosolids treatment. This site is unproductive and devoid of further mineral potential. The materials in this project include clean, approved, permitted and non-contaminated biosolids, composts, and dredged materials; free of contaminants and invasives. The estimated cost for these materials is \$0.30 per cubic yard mile; a cost that could be reduced significantly with a two way haul and local sourcing. Plant materials selected for this research are based on previous floristic surveys (i.e., native successional species). Also, purpose-grown tree species from the selective breeding efforts in Minnesota will be used. These include trees showing high productivity, used in combination with symbiotic products (i.e. mycorrhizae inoculum) to enhance plant growth and nutrient uptake, as well as benefits to organic matter accumulation in the soil.

**4. Tasks and Goals** – Baseline data will be gathered on the sites and materials. Treatments will be presented for regulatory approval. Materials will be transported, stockpiled, deployed and monitored for emerging vegetation. Undesirable plant species will be controlled and monitored. Plant materials will be sourced or propagated. As needed, plant materials will be held in University nurseries to ensure viable stock. Site modification, monitoring, sampling and planting will be conducted in stage to ensure succession. Survival and productivity as biometrics will be measured. The economic benefit of these plantings to the local forest products industry will be quantified by site comparison. These methods will demonstrate both environmental and economic benefits in a transferable, sustainable manner. The timeline of this project (four years, three growing seasons) is necessary to establish, measure, and monitor productivity.



## Environment and Natural Resources Trust Fund (ENRTF)

### 2014 Main Proposal

Project Title: Dredged Sediment for Forest Restoration on Unproductive Minelands

## II. PROJECT ACTIVITIES

### Activity 1: Site & Materials Characterization

Budget: \$ 89,935

Description: Establish baseline site description and materials characterization.

Outcome	Completion Date
1. Research site survey and layout	Sept 2014
2. Annual floristic survey (i.e. progress of revegetation)	Dec 2014
3. Materials ordering/acquisition/delivery and plant propagation (as necessary)	May 2015

### Activity 2: Logistics and Placement

Budget: \$ 128,300

Description: Coordinate transfer and deployment of Erie Pier Dredged Sediment to research site.

Outcome	Completion Date
1. Coordination, acquisition, transport, delivery and deployment of materials	May 2015
2. Baseline monitoring of emerging species (vegetation)	October 2015

### Activity 3: Sampling, Monitoring and Maintenance

Budget: \$ 257,350

Description: Quantify progress of restoration by sampling and measuring parameters twice per month.

Outcome	Completion Date
1. Site Management (planting, progressive sampling and initial monitoring)	July 2016
2. Continued monitoring, sampling and analyses of soils and plant tissue	Dec 2016
3. Continued biometrics (monthly) and data analyses	Dec 2017

### Activity 4: Technology Transfer

Budget: \$ 20,000

Description: Host annual field days for sponsors and one final seminar to expand restoration to other sites.

Outcome	Completion Date
1. Educate land managers to enable technology transfer of proven methods	June 2017

## III. PROJECT STRATEGY

**A. NRRI Project Team (ENRTF Funding):** Tom Levar , Principal Investigator; Larry Zanko, co-Investigator; Marsha Patelke, co-Investigator/Geologist; Craig Maly, Project Assistant; Bernie McMahon, Forest Geneticist; Julie Oreskovich, Scientist/GIS Specialist; Sara Post, Technician;; and associated NRRI technical staff/students.

**Partners (Not supported by ENRTF Funding):** Jim Plummer, Laurentian Vision Partnership; Mark St. Lawrence, St. Louis County Environmental Services; Dave Fink, St. Louis County Environmental Services

**Partners (Other/Potential In-Kind):** Mining companies, land managers, forest products companies, energy companies, US Army Corps of Engineers, municipalities, sanitary districts (pending).. Current and ongoing research sites are found at Hibtac, Keetac and in the Duluth area.

**B. Timeline Requirements** The timeline is extended to four years to accommodate the growth, performance, and monitoring of trees, including one final seminar to enable technology transfer.

**C. Long-Term Strategy and Future Funding Needs** This project is an extension and diversification of a currently funded Federal Grant directed and managed by NRRI. The technical findings and training module resulting from this project will be transferable to other areas in Minnesota and in the Great Lakes Region.

## 2014 Detailed Project Budget

Project Title: Dredged Sediment for Forest Restoration on Unproductive Minelands

### IV. TOTAL ENRTF REQUEST BUDGET 4 (four) years

<u>BUDGET ITEM</u>	<u>AMOUNT</u>
<b>Personnel (salary plus fringe) Note: All NRRI Staff</b> T Levar (.45 FTE) \$ 154,780, 73% sal 27%fringe; L Zanko (.15 FTE) \$ 63,072. 75% sal 25% fringe; B McMahon (.04 FTE) \$ 15,570, 75% sal 25% fringe; M Patelke (.04 FTE) \$ 13,888, 73% sal 27% fringe; J Oreskovich (.05 FTE) \$16,126, 73% sal 27% fringe; C Maly (.25 FTE) \$ 74,242, 73% sal 27%	\$ 396,920
<b>Contract #1:</b> Annual (recurring) Floristic Survey (G. Wilhelm at Conservation Forum, assisted by UMD botanist) baseline and successive plant indentification and density	\$ 12,000
<b>Equipment/Tools/Supplies:</b> and implement rental (seasonal) Tractor Trailer rental(seasonal) Planting supplies (seasonal, field) Soil and substrate materials sampling supplies Water sampling supplies Hydrologic monitoring supplies Plant tissue sampling supplies Seed sampling supplies Plant propagation, greenhouse and nursery supplies Planting stock (field and propagation) Agrichemicals and fertilizers (seasonal, field and greenhouse) Digital stereo microscope and supplies	\$ 21,500
<b>Travel:</b> Round trips, one leased vehicle, 120 mile each trip seasonal at twice per week (3,840 miles per four months per year or 15,360 seasonal plus 1,920 miles per year off season (two round trips per month for eight months) = 17,280 per year or 69,120 total miles for four year project X \$0.565 per mile = \$39,053; travel is needed for site establishment, site maintenance, monitoring, sample collection, coordination of activities and technical outreach	\$ 39,053
<b>University of MN Analytical Services:</b> Fees for chemical analysis of substrate, water and plant tissue (one composite samples per acre, 136 samples each type = 544 samples per year x four years = 2,176 samples X \$12.00 analytic cost per sample =\$26,112 total analytical cost for four years	\$ 26,112
<b>TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND \$ REQUEST =</b>	<b>\$ 495,585</b>

### V. OTHER FUNDS

<u>SOURCE OF FUNDS</u>		
<b>Other Non-State Monies</b> USACOE funding for cost and transport of dredged sediment from Erie Pier Containment Facility to research site St. Louis County Environmental Services - Site preparation and materials handling at reseach site (Please note: May be in kind)		<b>Pending</b>
<b>Funding History:</b> United States Army Corps of Engineers (Federal) 152,500 (\$129,787.20 direct; \$22,712.80 indirect/U of M overhead) through 2012 United States Department of Commerce Economic Development Administration: Minnesota Mining Cluster \$200,000 (Federal portion \$100K, plus \$100K PUTF match of which is \$166,225 direct; \$33,775 is indirect/University overhead)	\$352,500	Other - Expended in Full (September 2013)



## **2014 LCCMR Proposal: Dredged Sediment for Forest Restoration on Unproductive Minelands**

### **Project Manager Qualifications:**

Tom Levar began his career at the University of MN in 1975 working in Soil Science in peatland utilization and reclamation technologies. In 1984 he transferred to UMD-NRRI to continue his applied research initially to support the peat industry and related technologies. From 1992-99 he worked in private industry as a principle scientist in a construction company, as a general manager of bioremediation company and as a private consultant in agri-industries. He returned to UMD-NRRI in 1999 to resume research related to managed forest systems on marginal lands, that began early in his career.

Since 2010 the US Army Corps of Engineers (ACOE) and the Western Lake Superior Sanitary District (WLSSD) have supported research on the revegetation of a USS tailings basin (Keetac Operation) and a land restoration project at pit site owned by Cliffs Hibtac. These were later joined by the Economic Development Administration Minnesota Mining Cluster (EDA MMC). USS Keetac provided monies, labor and in kind support since the research helped to mitigate against fugitive dust from their installation. The application of biosolids from WLSSD and dredged sediment from ACOE Erie Pier were applied to this site to improve the substrate for the establishment of cover vegetation. A variety of tree species were also planted and monitored. NRRI was an integral partner in this research. The second phase of this research is supported by the EDA MMC and transfers this technology to other sites. Previous research involving NRRI staff provides the foundation for the current proposal, including the aforementioned projects and sites at Northland Country Club, the former Atlas Cement Site and the landfill at Moccasin Mike Point, Superior WI.

In addition, the proposed project includes innovations that have originated at NRRI and the project manager has been integral in those developments. One technology is the intellectual property known as Systemic Plant Conditioning Composition which is used to induce the uptake and translocation of small molecules into plants. This technology will be used to fortify and protect plants in the proposed project. Also, hybrid poplars (crosses owned by the University) will be used to reclaim our research sites, since these trees demonstrate accelerated growth.

### **Organization Description:**

The Natural Resources Research Institute (NRRI) affiliated with the University of Minnesota – Duluth (UMD) was established in 1983 by Governor Perpich and the State Legislature. NRRI's mission is to foster economic development of Minnesota's natural resources in an environmentally sound manner to promote private sector employment.

NRRI's scientific staff within the Center for Applied Research and Technology Development and elsewhere within the Institute, form the core of this research team.

The management of this project also recognizes the integral contributions of the Iron Range Resources and Rehabilitation Board, US Army Corps of Engineers, MN DNR, USS Keetac, Cliffs Hibtac, and the various commercial/industrial partners that continue to support this research. The foundation for this research has been provided by these entities and notably the US EDA for previous funding. These research activities have also been supported internally by NRRI and through the Laurentian Vision Partnership.