Environment and Natural Resources Trust Fund
2012-2013 Request for Proposals (RFP)

Project Title: **ENRTF ID:** **021-B**

Environmentally Sustainable Restoration Methods for Northeastern Minnesota Forestlands

Topic Area: B. Forestry/Agriculture/Minerals

Total Project Budget: $ 491,000

Proposed Project Time Period for the Funding Requested: 4 yrs, July 2013 - June 2017

Other Non-State Funds: $ 0

Summary:

Restoring long-term productivity to thousands of potential acres of marginal forestlands in Northeastern Minnesota using clean recycled sediments, biosolids, and compost: developing sustainable methods enhancing the regions environment and commerce.

Name: Thomas Levar

Sponsoring Organization: U of MN - Duluth NRRI

Address: 5013 Miller Trunk Hwy
Duluth MN 55811

Telephone Number: (218) 720-4333

Email tlevar@d.umn.edu

Web Address http://www.nrri.umn.edu/default/

Location

Region: NE

County Name: Aitkin, Cook, Itasca, Lake, St. Louis

City / Township:

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

PROJECT TITLE: Environmentally Sustainable Restoration Methods for Northeastern Minnesota Forestlands

I. PROJECT STATEMENT

1. Background – The total acreage of nonproductive lands related to mining and brownfields in Northeastern Minnesota exceeds 67,000 acres (see attached map with target area). Minelands include stockpiles, clearings, and active and inactive natural ore and taconite tailings basins, with the latter totaling >28,000 acres (D.Felleson, U of M, 1999). Brownfields include former industrial sites, petroleum sites and closed (and open) landfills, totaling over 39,000 acres (K.Sather – MPCA, 2012). Permits for the reclamation of these landforms are required by law; however, commercially integrated restoration has not been demonstrated relative to these lands. Therefore, the intent of this project is to demonstrate sustainable methods of reforestation on nonproductive lands to perpetuate dual benefits to the environment and local commerce.
2. Justification – The target sites are unproductive due to soil deficiencies of organic matter, nutrients and soil organisms, properties essential to support healthy plant growth, diversity and succession. The addition of 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; and 5) ultimately provide sustainable wood/biomass to local industries.
3. Materials and Methods – The soil additives in this project include approved, permitted and non-contaminated biosolids, composts, and dredged materials. Previously funded NRRI projects show them to be effective in building the soil and sustaining plant growth. Biosolids are biologically-stabilized, safety-approved municipal sewage sludge, permitted for forest application. Composts include yard waste from permitted facilities. Dredged materials include non-contaminated sediments excavated from navigation channels of the Duluth-Superior harbor (St. Louis River estuary) and other local bodies of water. The navigation channel sediments (a blend of sand, silt, clay, and organic matter) are products of ongoing natural erosional processes within the St. Louis River watershed. Economic benefits of local sourcing and cost sharing are important features of this project. The estimated cost for these materials is $0.40 per yard mile; a cost that could be reduced significantly with a two way haul and local sourcing. Purpose-grown tree species from the selective breeding efforts in Minnesota (previous research) will be used. These include trees showing high productivity, used in combination with organic products (i.e. mycorrhizae inoculum) to enhance plant growth and nutrient uptake.
4. Tasks and Goals – Three sites (two to five acres) will be selected: one brownfield, one landfill and one mineland site, all located in northeastern Minnesota. Selected sites will be used before regulated reclamation is initiated. Sites will be prepared and modified through the addition of biosolids, composts and dredged materials. Samples of soil and plant tissue will be taken to correlate to productivity. Plant species with symbiotic relationships to soil micro-organisms as well those important to forest succession will be used. Plantations will be established and managed using a cover crop, shrubs and trees on each site based on previous research. Survival and productivity as biometrics will be measured. The economic benefit of these plantations to the local forest products industry will be quantified. The selection and diversity of the plant species also has environmental benefits to wildlife and their habitat. 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 vegetation/tree survival and productivity.

II. DESCRIPTION OF PROJECT ACTIVITIES

Activity 1: Research Update, Site Characterization, Materials Acquisition **Budget: $ 91,000**

Outcome	Completion Date
1. Research update, coordinated participants – Logistical Plan	Sept 2013
2. Sites prepared and cover crop seeded with inoculum on sites	Dec 2013
3. Materials ordering/acquisition/delivery and plant propagation	May 2014

Activity 2: Substrate Modification and Site Preparation **Budget: $ 105,000**

Outcome	Completion Date
1. Coordination, acquisition and deployment of materials	May 2014
2. Final Site Preparation (weed eradication and plot layout)	June 2014

Activity 3: Test Site Establishment, Sampling, Monitoring, Maintenance **Budget: $ 245,000**

Outcome	Completion Date
1. Site Management (planting, progressive sampling and initial monitoring)	July 2014
2. Continued monitoring, sampling and analyses of soils and plant tissue	Dec 2014
3. Continued biometrics (monthly) and data analyses	Dec 2016

Activity 4: Host One Technology Transfer Seminar **Budget: $ 50,000**

Outcome	Completion Date
1. Training seminar – hosting, presenting and transfer of methods/technology	June 2017

III. PROJECT STRATEGY

A. Project Team/Partners (Note: NRRI Staff are supported by grant monies, i.e. not State employees)
NRRI/UM Team (LCCMR Funding): Tom Levar , Principal Investigator and Project Manager; Marsha Patelke, co-Investigator/Geologist; Larry Zanko, co-Investigator and Administrative/Technical Advisor; Craig Maly, Project Assistant; Bernie McMahon, Forest Geneticist; Tim O'Brien, UM; Julie Oreskovich, Scientist/GIS Specialist; Steve Hauck, Technical Review; and associated NRRI technical staff/students.
Partners (LCCMR Funding): Dan Jordan (IRRRB advisor, pending approval)
Partners (Other/Potential In-Kind): Mining companies, land managers, forest products companies, energy companies, US Army Corps of Engineers, municipalities, sanitary districts (not currently committed)

B. Timeline Requirements The timeline is extended to four years to accommodate the growth, performance, and monitoring of trees, including one final training 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, including: tailings basins, mine spoils banks, gravel pits, brownfields, superfund sites and other marginal lands. Supplemental, additional funding will be sought to continue site monitoring, testing and technology transfer in cooperation with landowners and agencies.

2013-2017 Detailed Project Budget

Project Title: Environmentally Sustainable Restoration Methods for Northeastern Minnesota Forestlands

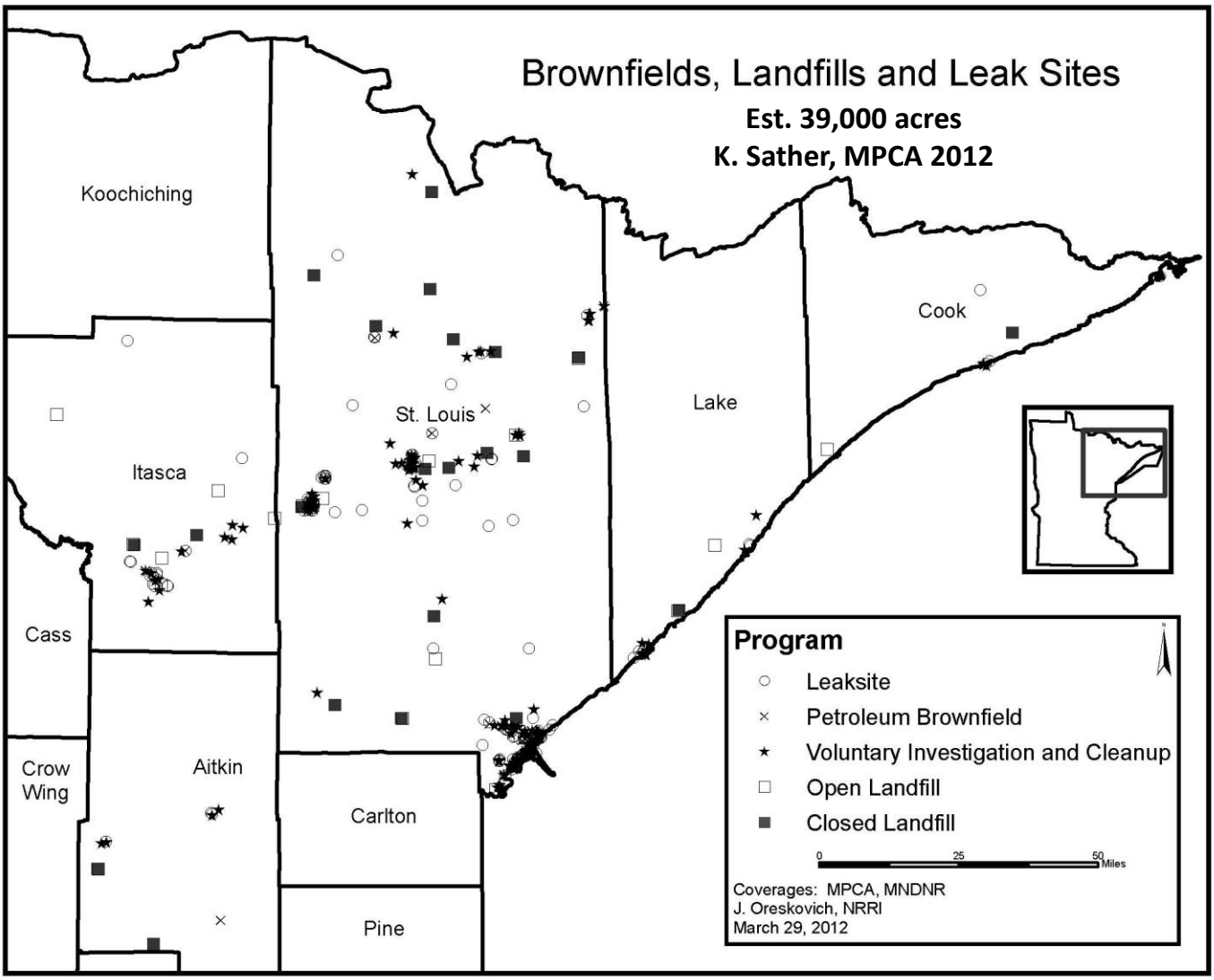
IV. TOTAL ENRTF REQUEST BUDGET 4 (four) years

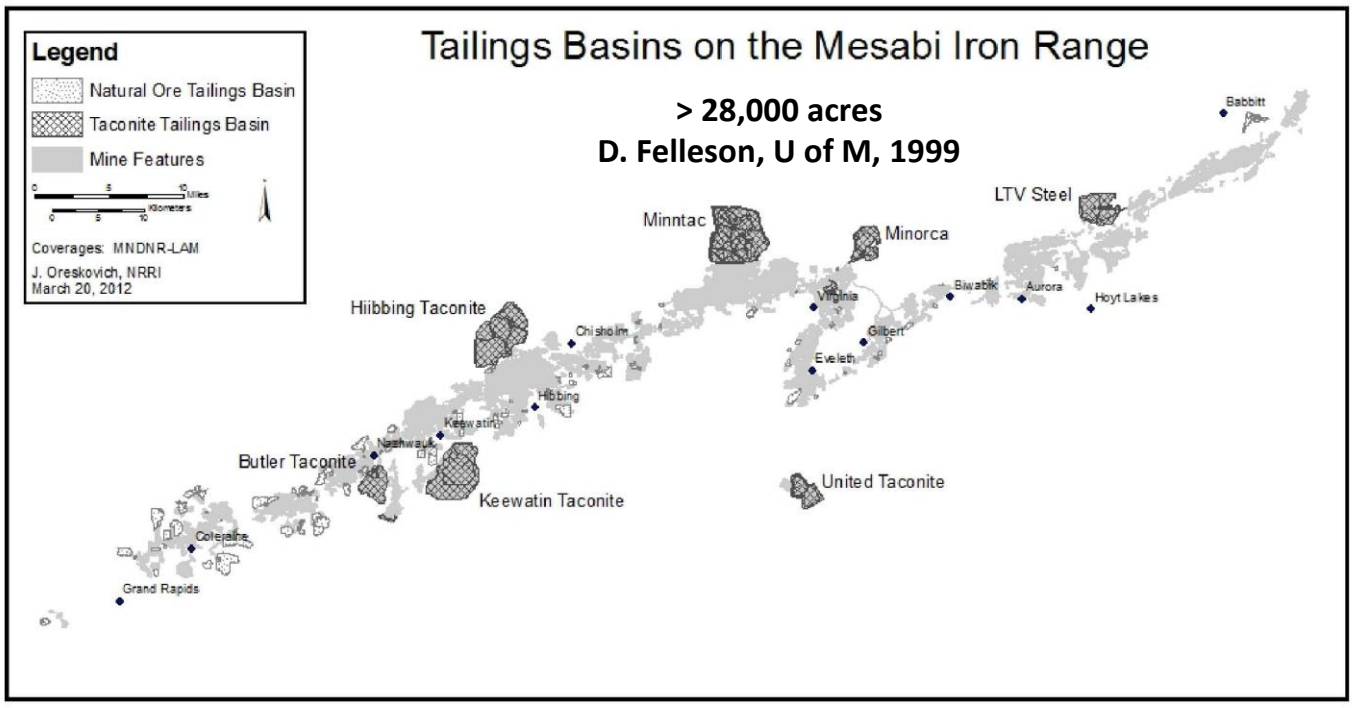
BUDGET ITEM	AMOUNT
Personnel: T Levar, Project Manager and Prinicipal Investigator (40% FTE: 59.9% salary, 40.1% fringe; 4 years): Overall project management and coordination of all activities, direction/inspection of progress, technical supervision, reporting, presentations, seminars	$ 140,000
Personnel: NRRI Center for Applied Research and Technology Development Technical Personnel (50% FTE: 65% salary, 35% fringe; 4 years): co-Investigators and scientists; plant materials acquisition and propagation, plot establishment/maintenance/monitoring, data entry, GIS, administration, reporting; 2-3 FTE combined including student workers	$ 187,000
Personnel: University of MN Technical Personnel; plot technician(s) (15% FTE: 65% salary, 35% fringe; 2.5 years): propagation, plot establishment/monitoring, data collection, reporting; 2-3 FTE combined	$ 40,000
Contracts #1: Mineland reclamation specialist/s (D Jordan of IRRRB and/or MN DNR)	$ 18,000
Contracts #2: Sediment transport and deployment (TBD, $500 per truckload)	$ 45,500
Contracts #3: External laboratory analytical fees (TBD, multiple labs)	$ 12,500
Equipment/Tools/Supplies: Misc. field supplies/tools	$ 7,500
Equipment/Tools/Supplies: Plant materials and supplies	$ 4,500
Equipment/Tools/Supplies: Sampling supplies (for substrate, plant tissue, water) and digital stereo microscope for documenting seed and plant viability	$ 6,500
Travel: Project vehicle/s for field work and in state meetings (based on ~ 40,000 miles total @ $0.555 per mile or 10,000 miles per year)	$ 22,000
Travel: Per diem (lodging and meals) for in-state meetings, activities and field work	$ 7,500
TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND $ REQUEST =	$ 491,000

V. OTHER FUNDS

SOURCE OF FUNDS	AMOUNT	Status
Other Non-State $ Being Applied to Project During Project Period	$ -	**NA**
In-kind Services During Project Period: Materials (sediment and biosolids) costs, material handling and transport to restoration sites (Critical to execution of project)	$ -	**Pending**
Funding History: 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)

Potential Landforms for Restoration





2012-2013 LCCMR Proposal: Environmentally Sustainable Restoration Methods for Northeastern Minnesota Forestlands

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). 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.

In addition, the proposed project includes innovations that have originated at NRRI and the project manager has been integral in those developments. One innovation 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, as well as the technical staff from UMD and the University's North Central Research and Outreach Center (Grand Rapids), 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 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.