Environment and Natural Resources Trust Fund
2010 Request for Proposals (RFP)

LCCMR ID: 028-A3

Project Title:

Mineland Sulfate Release in Saint Louis River Basin

LCCMR 2010 Funding Priority:

A. Water Resources

Total Project Budget: $ $270,000

Proposed Project Time Period for the Funding Requested: 2 years, 2010 - 2012

Other Non-State Funds: $ $0

Summary:

Mineland sulfate releases evaluated for potential to increase Mercury in fish in the St. Louis River Basin. Management recommendations will be made to help the state manage this emerging issue.

Name: Michael Berndt

Sponsoring Organization: DNR

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Web Address: dnr.state.mn.us

Location:

Region: NE

County Name: Carlton, St. Louis

City / Township:

_____ Knowledge Base _____ Broad App. _____ Innovation

_____ Leverage _____ Outcomes

_____ Partnerships _____ Urgency _____ TOTAL

PROJECT TITLE: Mineland Sulfate Releases in St. Louis River Basin

I. PROJECT STATEMENT

The St. Louis River Basin serves multiple purposes ranging from recreational fishing and boating to agriculture, forestry, and hydroelectric power generation. The basin is probably most well known for hosting the Mesabi Iron Range, a world class ore deposit that has supplied iron for the United States continuously since the late 1880's. Less well known are the nearby undeveloped copper-nickel / precious metal deposits that are likely to be an important future U.S. resource for these metals.

Mining features including waste rock piles, open pits, and tailings basins on the Iron Range are the dominant source of sulfate (SO_4) to the St. Louis River. Left unabated, SO_4 releases are likely to increase over the next century as active mines are deepened, new mines are opened, and more waste rock and tailings are generated. Although no water quality standards have been established for SO_4, the Minnesota Pollution Control Agency has developed temporary guidelines focused on avoiding high SO_4 discharges to waters where the potential exists to increase methylmercury (MeHg) and fish mercury (Hg) concentrations anywhere downstream. High fish-Hg can, in turn, adversely affect the health of fish consumers including eagles, osprey, loons, otters, and human beings.

Department of Natural Resources collaborative studies have revealed that SO_4 concentrations fluctuate widely in the St. Louis River, reaching highest levels near the mining district during dry periods and lowest levels downstream, particularly during wet periods. While the general release mechanisms and SO_4 treatment schemes are understood, treatment costs are very high while the level of protection each level of treatment affords to the environment is largely unknown. As of yet, no clear strategy has been developed in Minnesota to balance the economic needs of the state or the national appetite for metals against the environmental consequences of increasing SO_4 discharges to the St. Louis River.

The proposed study will advance along three fronts: (1) mapping of current sulfate sources (waste rock piles, tailings basins, water-filled pits), (2) providing an objective assessment of treatment options, including heretofore untried (in Minnesota) in-pit SO_4 reduction, and (3) evaluation of the likely impacts of seasonally controlled SO_4 releases from Cloquet to the St. Louis River Estuary (on-going DNR research has focused on the river north of Cloquet). The result of this research will be a consistent and comprehensive series of recommendations and supporting documents that state agencies, decision makers, and other stake holders can rely on to manage SO_4 releases to the St. Louis River as mining companies continue to bring forward plans for expansion and development in the foreseeable future.

II. DESCRIPTION OF PROJECT RESULTS

Result: A series recommendations and supporting documents that state agencies, decision makers, and other stake holders can rely on to help manage SO_4 releases to the St. Louis River.

Budget: $270,000

Deliverables	Completion Date
1. A preliminary report detailing current MeHg and SO_4 levels in the St. Louis River and the St. Louis River Estuary.	June 2011
2. A final report detailing MeHg and SO_4 relationships in the St. Louis River and the St. Louis River estuary.	June 2012
3. A final report that documents current SO_4 sources and their concentrations.	June 2012

4. A final report evaluating SO_4 treatment options. June 2012
5. Recommendations for managing SO_4 releases to the St. Louis River. June 2012

III. PROJECT STRATEGY

A. Project Team/Partners

Name	Organization	Title	Project role
Michael Berndt	MN DNR Division of Lands and Minerals	Research Scientist III	Principal Investigator
Travis Bavin	MN DNR Division of Lands and Minerals	Research Scientist I	Assistant Scientist

B. Timeline Requirements

Task	Timeline
Evaluate present and estimate future SO_4 releases from minelands in the St. Louis River Basin	July 2010 -September 2010
Evaluate cost and effectiveness of treatment options for SO_4-bearing pit waters and SO_4-generating stock piles	July 2010 – February 2012
Compile existing, relevant data MeHg generation in the St. Louis River including the St. Louis River Estuary	March 2011 – June 2011
Where needed, collect and analyze SO_4, Hg, and MeHg from the St. Louis River including the St. Louis River Estuary	April 2011 – October 2011
Analyze the newly acquired data in the context of existing literature	November 2011 –February 2012
Generate final recommendations and assemble supporting reports	March 2012 – June 2012

C. Long-Term Strategy

The DNR Division of Lands and Minerals conducts primary research on emerging environmental issues that have the potential to affect present and future policy decisions in Minnesota. The objective of this research is in line with our agency's mission which is to ensure that mineral development in the state is environmentally sound, and mined areas are reclaimed to be safe, free of pollution, and suitable for future use.

Results from an initial SO_4 and Hg survey study conducted by the DNR in consultation with experts at the MPCA have been presented and discussed at numerous public meetings including:

Sept. 7, 2008- Iron Mining Association: Sulfate and Hg in the St Louis River Basin
Feb. 18, 2009- Clean Water Legacy monitoring in the St. Louis River Basin
Mar. 7, 2009 - Lake Superior Bi-National Program Webinar Series: Environmental Impacts of Mining in the Lake Superior Basin.
April 14, 2009: – 82nd Annual Meeting of Society of Mining, Metallurgy, and Exploration (SME), Duluth Minnesota.

This proposed research is a direct response to feedback and encouragement received from mining representatives, concerned citizens, and state, tribal, and federal agencies following these meetings.

Draft Project Budget

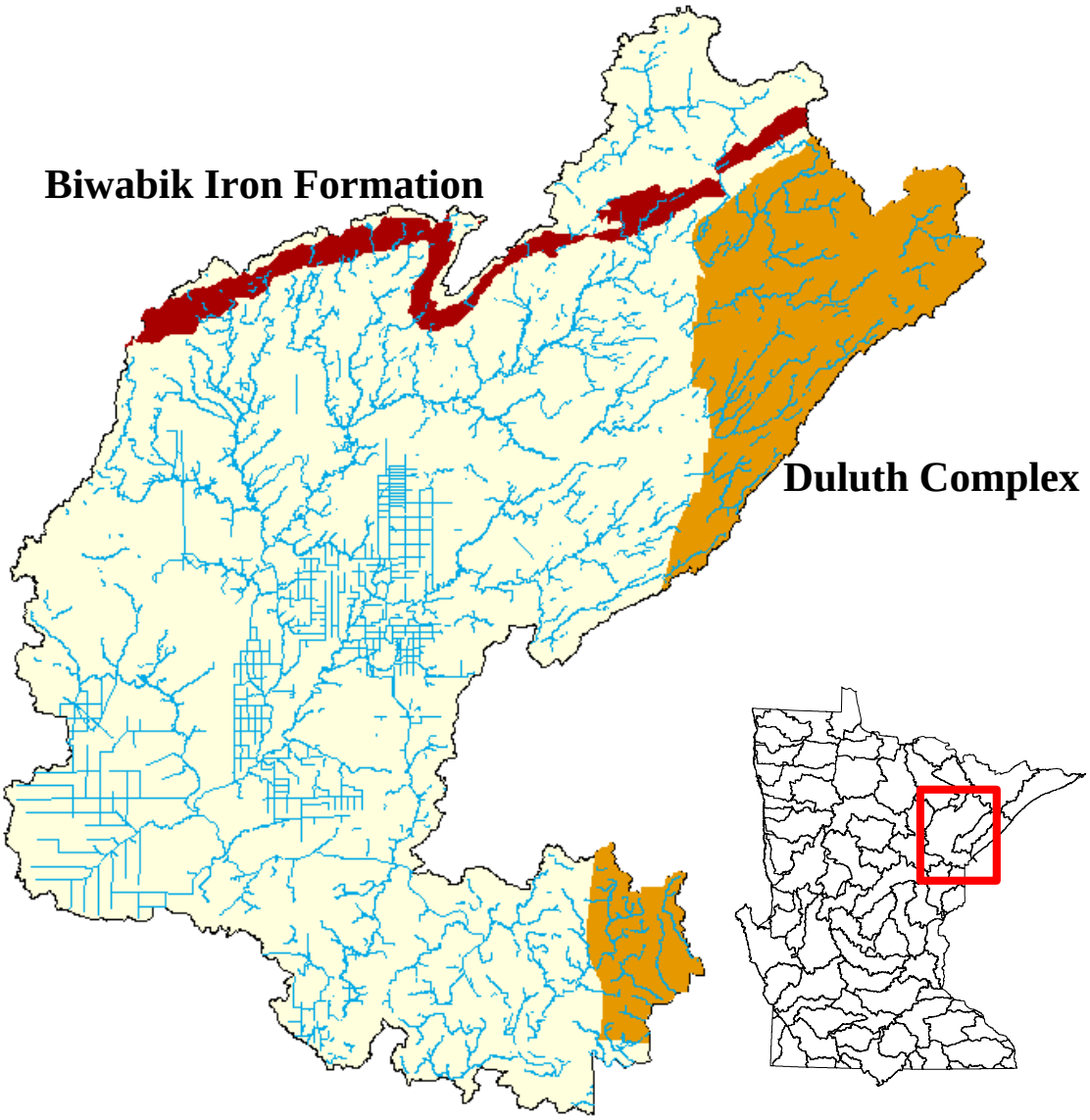
IV. TOTAL PROJECT REQUEST BUDGET (2 years)

BUDGET ITEM	AMOUNT
Personnel: Mike Berndt, Research Scientist III, 10% time, 2 years Travis Bavin, Research Scientist I, 100% time, 2 years John Folman, Chemist I, 20% time, 2 years Jordan Goodman, Mining Aide, 10% time, 2 years	$ 165,000
Contracts: Cebam Analytical Inc., Seattle, WA, mercury analysis University of Minnesota Aqueous Geochemistry Lab, Minneapolis, MN, cation and anion analyses Minnesota Department of Health Laboratory, St. Paul, MN, DOC analyses Minnesota Department of Agriculture Laboratory, St. Paul, MN, nutrient analyses Waterloo Environmental Isotope Laboratory, Waterloo, Ontario, isotope analyses	$ 95,000
Equipment/Tools/Supplies: Glass bottles for mercury collection Disposible filters for mercury filtration Plastic bottles for nutrient, cation, anion, and isotope collection Teflon coated sampler for collecting water Other lab supplies (gloves, chemicals, etc.)	$ 5,000
Acquisition (Fee Title or Permanent Easements):	N/A
Travel: Travel to the field site for sample collection Travel to scientific conferences, meetings, and various stake-holder meetings	$ 5,000
Additional Budget Items:	N/A
TOTAL PROJECT BUDGET REQUEST TO LCCMR	$ 270,000

V. OTHER FUNDS

SOURCE OF FUNDS	AMOUNT	Status
Other Non-State $ Being Applied to Project During Project Period:	$ -	
Other State $ Being Applied to Project During Project Period:	$ -	
In-kind Services During Project Period:	$ -	
Remaining $ from Current Trust Fund Appropriation (if applicable):		
Funding History: Minerals Coordinating Committee Minnesota Pollution Control Agency	$ 120,000	

Ore hosts in the St. Louis River Basin



Michael E. Berndt, PhD: Research Scientist III, MN DNR Division of Lands and Minerals. Dr. Berndt is the Principal Investigator for this project. He will coordinate and participate in research activities and communicate results to state agencies, industry representatives, and concerned citizens.

Education:
1980: BS Geology and BS Geophysics, University of Minnesota
1983: MS Geology, University of Wisconsin
1987: PhD Geology, University of Minnesota

Work Experience:
1987-2001: Post-Doctoral Research Associate/Senior Research Associate at University of Minnesota: Conducted research in geochemistry. Taught courses in Aqueous Geochemistry and Economic Geology. Consultant to MDNR, MDH, and US B. of Mines.

2001-present: Research Scientist at Minnesota DNR – Mineland Reclamation Group:

- Project director for DNR's Coordinated Mercury Research Effort to reduce mercury in taconite stack emissions
- Project director for DNR's MCC study on fate of sulfate released by mining activities on Minnesota's Iron Range
- Project director for Geochemistry of in-pit taconite tailings disposal project

Recent Publications and Reports:

Bavin, T. K. and Berndt, M. E. (2008) Sources and fate of sulfate in NE Minnesota watersheds: MN DNR, St. Paul, MN, 23p. plus figs, tables, and appendices.

Berndt, M. E. and Brice, W. (2008) The Origins of Public Concern with Taconite and Human Health: Reserve Mining and the Asbestos Case: Reg. Toxicol. and Pharm., 52, S31-S39.

Berndt, M. E. and Engesser, J. (2007) Mercury Transport in Taconite Processing Facilities: (III) Control Method Test Results. IOCR Final Report. MN DNR 38 p + Appendices

Berndt, M. E. and Leibfried, R. (2007), A Geochemical Tracer Study of Minnesota's First In-Pit Disposal Facility for Taconite Tailings, MN DNR, 36 p. + Append.

Berndt, M. E. (2008) On the Measurement of Stack Emissions at Taconite Processing Plants. A Progress Report Submitted to the MPCA, 28 pp.

Organizational Description:

The Minnesota Department of Natural Resources, Lands and Minerals Division is responsible for ensuring that mineral development in the state is environmentally sound, and mined areas are reclaimed to be safe, free of pollution, and suitable for future use.