# Environment and Natural Resources Trust Fund

2021 Request for Proposal

## General Information

**Proposal ID:** 2021-216

**Proposal Title:** White Iron Chain of Lakes: Baseline Trace Metals

## Project Manager Information

**Name:** Mark Brigham

**Organization:** US Geological Survey - Upper Midwest Water Science Center

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## Project Basic Information

**Project Summary:** This project will establish pre-industrial and pre-mining trace metal conditions in a chain of lakes within a proposed copper-nickel mining area of northeastern Minnesota.

**Funds Requested:** $117,000

**Proposed Project Completion:** 2023-06-30

**LCCMR Funding Category:** Small Projects (H)

**Secondary Category:** Water Resources (B)

## Project Location

**What is the best scale for describing where your work will take place?**

Region(s): NE

**What is the best scale to describe the area impacted by your work?**

Region(s): NE

**When will the work impact occur?**

In the Future

## Narrative

**Describe the opportunity or problem your proposal seeks to address. Include any relevant background information.**

There is considerable interest in developing a copper-nickel mining operation within the Birch Lake watershed in northeastern Minnesota, near the town of Babbitt. Birch Lake would be immediately downstream of potential mining operations; downstream lakes including White Iron, Farm, Garden, and Fall Lake could also potentially be affected by mining operations. The White Iron Chain of Lakes Association and Lake County are concerned that these lakes be adequately characterized prior to any potential mine development, and have requested the U.S. Geological Survey to conduct the proposed study.

Several monitoring efforts have gathered trace metal data in water and sediment from lakes in this area. However, none of the efforts have examined deeper (older strata) of lake sediments to assess changes throughout time since European settlement. Furthermore, lake water data are available, but limited. Activities such as logging / forestry; iron mining; human settlements (town of Babbitt, and lakeshore development); and long-range atmospheric transport from distant sources all have the potential to increase trace element concentrations in surficial lake sediments.

**What is your proposed solution to the problem or opportunity discussed above? i.e. What are you seeking funding to do? You will be asked to expand on this in Activities and Milestones.**

To gain an understanding of trace element concentrations through time, all the way back to pre-settlement times, we propose trace metal analyses of archived samples from previously collected lake-sediment cores from the area of interest. In addition, we propose sampling water from each of the lakes to provide an updated water-quality baseline data set, using updated water analysis methods.

**What are the specific project outcomes as they relate to the public purpose of protection, conservation, preservation, and enhancement of the state's natural resources?**

Insufficient baseline data has been an Achilles heel of mining activities in other areas, allowing both mining industry and environmental activists to make claims that are not able to be readily checked against benchmark data. The data from this study will provide an objective benchmark against which people can evaluate the effects of past activities within the watershed, as well as potential future mining activity should it come to pass. This will allow management activities to be guided by data and science, rather than unsupported claims.

## Activities and Milestones

### Activity 1: Trace element profiles from dated sediment cores in the White Iron Chain of Lakes

**Activity Budget:** $18,000

**Activity Description:**

A prior study, Paleolimnological Reconstructions for the White Iron Chain of Lakes, collected detailed lake-sediment cores from each of the five lakes in the study area in 2011. These cores have been analyzed for nutrients, diatoms, and basic physical and chemical characteristics under the direction of Dr. Euan Reavie, NRRI. In addition, the cores have been dated by lead-210 by Dr. Daniel Engstrom, SCWRS. Subsamples from these dated cores are archived, and available for trace metal analysis. Thus, the current study takes advantage of substantial prior investment in field, analytical, and interpretive work.

We propose analyzing all archived core increments from the surface (representing approximately 2011) down to a depth in the sediments that corresponds to approximately the year 1800, as previously determined from lead-210 dating. In total, this represents 160 samples from five lake cores. Samples would be analyzed for a suite of 44 trace elements, including key elements of interest copper, nickel, zinc, aluminum, iron, manganese, and cobalt. Samples will be analyzed by a U.S. Geological Survey contract laboratory that is quality-assured by the USGS, and has analyzed thousands of samples nationwide for the National Geochemical Survey.

**Activity Milestones:**

| Description | Completion Date |
|---|---|
| Subsample NNRI sediment core archives | 2021-08-31 |
| Sample analysis at USGS contract lab | 2022-01-31 |
| Data quality assurance & upload into data base | 2022-03-31 |

### Activity 2: Seasonal water sampling for trace elements in the White Iron Chain of Lakes

**Activity Budget:** $65,000

**Activity Description:**

Conduct three rounds of sampling in each of the five lakes. Sample both filtered water and whole water for trace elements and major constituents. Samples will be analyzed at the U.S. Geological Survey's National Water Quality Laboratory, which has been used in numerous regional and national water quality assessments. Sampling would be conducted in May, July, and September to capture a range of seasonal conditions.

**Activity Milestones:**

| Description | Completion Date |
|---|---|
| Water sampling from White Iron Chain of Lakes | 2022-09-30 |
| Sample analysis at USGS lab | 2022-12-31 |
| Data quality assurance and upload into data base | 2023-03-31 |

### Activity 3: Scientific reporting and outreach

**Activity Budget:** $34,000

**Activity Description:**

Data will be interpreted and summarized in a peer-reviewed journal article or USGS series report. Raw data will be made

available permanently via a web data release. Project staff will present results at forums of interest to key stakeholders, including: Rainy-Lake of the Woods Forum, held in March every year (the White Iron chain of lakes is in this drainage basin); the St. Louis River Summit (adjacent drainage basin that shares similar geology and concerns); and the Minnesota Water Resources conference. Raw data will be served to the public via an online web interface.

**Activity Milestones:**

| Description | Completion Date |
|---|---|
| Approve data for online release | 2023-04-30 |
| Present results at three Minnesota conferences | 2023-06-30 |
| USGS-approved interpretive report | 2023-06-30 |

## Long-Term Implementation and Funding

**Describe how the results will be implemented and how any ongoing effort will be funded. If not already addressed as part of the project, how will findings, results, and products developed be implemented after project completion? If additional work is needed, how will this be funded?**
The interpreted data will provide a baseline of conditions against which future work can be compared. We are not seeking long-term funding.

## Project Manager and Organization Qualifications

**Project Manager Name:** Mark Brigham

**Job Title:** Supervisory Hydrologist

**Provide description of the project manager's qualifications to manage the proposed project.**
Project manager has 28 years of experience as a scientist with the U.S. Geological Survey, with an emphasis on contaminants (including trace elements) in aquatic ecosystems (water, sediment, and other media). Established track record of scientific publications and presentations of findings at stakeholder meetings.

**Organization:** US Geological Survey - Upper Midwest Water Science Center

**Organization Description:**
Minnesota office of the U.S. Geological Survey, a federal earth science agency.

## Budget Summary

| Category / Name | Subcategory or Type | Description | Purpose | Gen. Ineligible | % Benefits | # FTE | Classified Staff? | $ Amount |
|---|---|---|---|---|---|---|---|---|
| **Personnel** | | | | | | | | |
| Hydrologist | | Lead scientist & Project Chief | | | 25% | 0.24 | | $63,000 |
| Hydrologic Technician | | Field & Data support | | | 25% | 0.1 | | $15,000 |
| | | | | | | | **Sub Total** | **$78,000** |
| **Contracts and Services** | | | | | | | | |
| USGS contract laboratory | Professional or Technical Service Contract | Chemical analysis of lake sediments | | | | 0 | | $4,000 |
| USGS National Water Quality Laboratory | Internal services or fees (uncommon) | Chemical analysis of water samples | | | | 0 | | $23,000 |
| | | | | | | | **Sub Total** | **$27,000** |
| **Equipment, Tools, and Supplies** | | | | | | | | |
| | Tools and Supplies | Sample containers & Misc field supplies | Store samples for chemical analysis; misc field supplies for collecting, cleaning, and transporting samples | | | | | $500 |
| | Tools and Supplies | Field monitor rental | rental of multi-parameter field water quality probe | | | | | $200 |
| | Tools and Supplies | Boat rental | Boat rental for conducting water sampling | | | | | $300 |
| | | | | | | | **Sub Total** | **$1,000** |
| **Capital Expenditures** | | | | | | | | |
| | | | | | | | **Sub Total** | **-** |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Acquisitions and Stewardship** | | | | | | | | |
| | | | | | | | **Sub Total** | **-** |
| **Travel In Minnesota** | | | | | | | | |
| | Miles/ Meals/ Lodging | Travel to Duluth | Subsample sesdiment core samples archived at UMD | | | | | $600 |
| | Miles/ Meals/ Lodging | 3 Field trips to study area (multiple day trips) | Field work / sampling lakes & meeting with local stakeholders | | | | | $2,900 |
| | Conference Registration Miles/ Meals/ Lodging | Registration for three conferences; travel to two in-state conferences in northern MN | Present findings to multiple stakeholders in study area, and at state water conference | | | | | $1,500 |
| | | | | | | | **Sub Total** | **$5,000** |
| **Travel Outside Minnesota** | | | | | | | | |
| | | | | | | | **Sub Total** | **-** |
| **Printing and Publication** | | | | | | | | |
| | Publication | Journal page charges with open access (or USGS series report) | publish findings in an open access journal (or internal publication costs) | | | | | $3,000 |
| | | | | | | | **Sub Total** | **$3,000** |
| **Other Expenses** | | | | | | | | |
| | | Shipping | shipment of samples to analytical labs | | | | | $500 |
| | | Overtime pay | Pay technician overtime salary for field trip hours that exceed a 40-hr work week, per Fair Labor Standards Act | | | | | $2,500 |
| | | | | | | | **Sub Total** | **$3,000** |
| | | | | | | | **Grand Total** | **$117,000** |

## Classified Staff or Generally Ineligible Expenses

| Category/Name | Subcategory or Type | Description | Justification Ineligible Expense or Classified Staff Request |
|---|---|---|---|

## Non ENRTF Funds

| Category | Specific Source | Use | Status | Amount |
|---|---|---|---|---|
| **State** | | | | |
| | | | **State Sub Total** | **-** |
| **Non-State** | | | | |
| Cash | U.S. Geological Survey Cooperative Matching Fund program | These funds will match a portion of the ENRTF funds. $67,000 of these dollars will fund indirect costs (bureau & center overhead and facilities costs). The remainder will directly fund project direct costs. | Pending | $78,000 |
| | | | **Non State Sub Total** | **$78,000** |
| | | | **Funds Total** | **$78,000** |

## Attachments

### Required Attachments

*Visual Component*

File: b66fa24d-668.pdf

*Alternate Text for Visual Component*

Map of study area, including lakes in the White Iron Chain of Lakes, near the towns of Babbitt and Ely, Minnesota.

## Administrative Use

**Does your project include restoration or acquisition of land rights?**

No

**Does your project have patent, royalties, or revenue potential?**

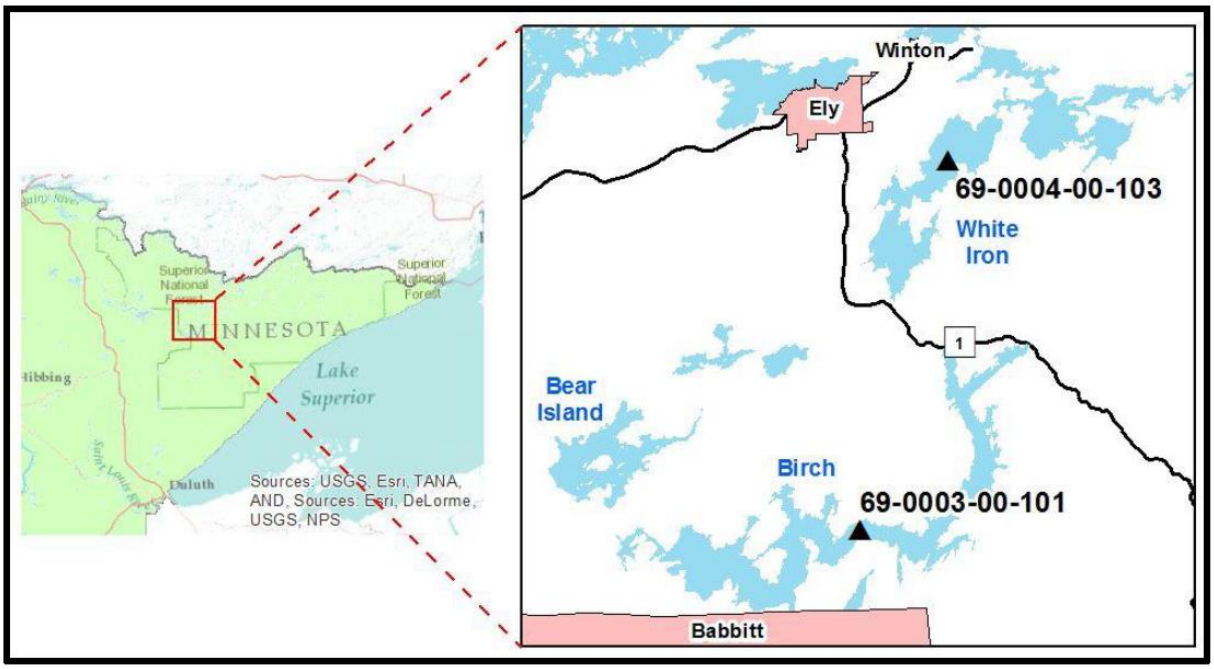
No

**Does your project include research?**

Yes

**Does the organization have a fiscal agent for this project?**

No




Location map of study area, from Baratono & Anderson, 2012, MPCA report.