

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

Project Title:

ENRTF ID: 040-B

Measuring hydrologic benefits from Glacial Ridge habitat restoration

Category: B. Water Resources

Total Project Budget: \$ 168,500

Proposed Project Time Period for the Funding Requested: 2 Years, July 2014 - June 2016

Summary:

This project will enhance work to measure and extend flooding and water-quality benefits of wetland and prairie restorations at Glacial Ridge NWR by leveraging an existing comprehensive hydrologic characterization.

Name: Tim Cowdery

Sponsoring Organization: Red Lake Watershed District

Address: 2280 Woodale Dr
Mounds View MN 55112-4900

Telephone Number: (763) 783-3273

Email: cowdery@usgs.gov

Web Address: <https://sites.google.com/site/largescaleresto/>

Location

Region: Northwest

County Name: Polk, Red Lake

City / Township: Gentilly, Lake Pleasant, Terrebonne, Kertsonville, Tilden, Grove Park, Onstad, Godfrey, W

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



PROJECT TITLE: Measuring hydrologic benefits from Glacial Ridge habitat restoration

I. PROJECT STATEMENT

Flooding, degraded water quality and habitat loss are among the greatest natural resource challenges faced by Minnesotans. Starting in the year 2000, a diverse group of more than thirty partners set out to demonstrate that large-scale habitat restoration is a viable way to reduce flooding and improve water quality. Among the largest prairie-wetland restorations in the world, the Glacial Ridge Project spans more than 22,000 acres, and is adjacent to an additional 16,000 acres of private and public conservation land. **How significant are the benefits of large-scale habitat restoration to flood reduction and water quality?** This project is an historic opportunity to provide real numbers that measure these improvements. The overall goal of the project is to characterize and measure the amount of flood reduction, water-quality improvement, and ecosystem-function change of the hydrologic system resulting from wetland and prairie restoration at Glacial Ridge. In so doing, the project will measure the success of restoration techniques employed on this land. The project will use these results to identify other parts of Minnesota that could benefit from similar restorations and quantify the resulting potential water and habitat improvements.

Glacial Ridge presents a unique opportunity to measure restoration benefits because of its size and a \$1.8-million comprehensive hydrologic characterization of the area prior to restoration. This study was conducted by the U.S. Geological Survey (USGS) during 2002–5. The resulting hydrologic baseline makes it possible to quantify to what degree the restorations contributed to flood reduction and water quality improvements. The USGS began the post-restoration characterization in 2011 with initial funds provided by the U.S. Fish and Wildlife Service’s (USFWS) Plains and Prairie Potholes Landscape Conservation Cooperative, USFWS Region 3, Glacial Ridge Wildlife Refuge, and the City of Crookston. This initial \$562,000 investment funded data collection needed to determine hydrologic benefits through 2012. The LCCMR provided \$400,000 of the \$568,500 needed to complete the project beginning in 2013. Further LCCMR funding will complete this project in its full detail and produce the definitive evidence that habitat restoration generates big benefits for flood reduction and water-quality improvement.

The project is divided into 3 main activities:

- **Water flows**—the amount and directions of water flowing through the groundwater and surface-water system of the restored wetland and prairies will be characterized and measured.
- **Water quality**—the restored area will be characterized and analyzed for variability and trends.
- **Pre-and post-restoration changes** between the hydrology will be analyzed and attributed to the restorations, or other factors (e.g. changes in precipitation). The effects of the restoration changes would then be extended to other parts of Minnesota where such restorations could be implemented to provide similar benefits. This analysis will identify portions of watersheds where restorations will have the most impact and quantify the size of those impacts. This knowledge is crucial to an accurate restoration cost/benefit analysis.

II. DESCRIPTION OF PROJECT ACTIVITIES

Activity 1: Measure and characterize water flows through all parts of the water cycle in 2 additional surface (SW) and groundwater (GW) basins. **Budget:** \$84,300

- Flow out of the 2 additional SW basins measured continuously.
- Water levels and precipitation measured continuously at 3 additional wells



Environment and Natural Resources Trust Fund (ENRTF)

2014 Main Proposal

Project Title: Measuring hydrologic benefits from Glacial Ridge habitat restoration

- Flows among all parts of the water cycle are calculated and explained by factors like precipitation and land cover to characterize its post-restoration state.

Outcome	Completion Date
1. Flows are measured in all components of the water cycle in 1 SW basins	October 2015
2. Flow variability is explained by relevant factors	October 2015

Activity 2: Measure and characterize water quality and trends at 3 wells and 2 stream bi-monthly for fertilizers and suspended sediment **Budget:** \$33,300

- Water quality data are analyzed for trends and variability to characterize its post-restoration status.

Outcome	Completion Date
1. GW and SW status and trend sampling for nutrients and suspended sediment	October 2014
2. Water quality trend and variability analysis	June 2016

Activity 3: Attribute changes to restorations and extend results to all of Minnesota **Budget:** \$50,900

- Compare changes in flows and water quality between pre- and post-restoration waters
- Attribute any changes to restorations or other factors such as precipitation variability.
- Identify other parts of Minnesota that show promise for restoration and quantify benefits.

Outcome	Completion Date
1. Pre- and post-restoration hydrologic comparison	June 2016
2. Extend restoration hydrologic implications to other areas of Minnesota	June 2016
3. Final project report	June 2016

III. PROJECT STRATEGY

A. Project Team/Partners

- Myron Jesme, Administrator, Red Lake Watershed District. Mr. Jesme will be the administrator of the project. The District will be receiving minimal ENRTF funds for project oversight and reporting.
- Tim Cowdery, Hydrologist, U.S. Geological Survey. Mr. Cowdery will be the principal investigator of the project. The USGS will be contributing 33 % of the non-water analysis project funds. The USGS will be receiving nearly all of the ENRTF funds. Mr. Cowdery is a principal investigator of the related USFWS Land Conservation Cooperative (LCC) project.
- Josh Eash, Hydrologist, U.S. Fish and Wildlife Service. Mr. Eash is a principal investigator of the USFWS LCC project, is a project science advisor and provides field support for data collection. Mr. Eash will be providing support to the project but will not be receiving project funds.

B. Timeline Requirements

The project will take 2 more years to complete (July 2014-June 2016). The first year of the project will add to three years of data collection already completed to ensure that the hydrology is measured under a variety of annual weather patterns. The second year will see the data analysis and report completed.

C. Long-Term Strategy and Future Funding Needs

This proposal funds the final 2 years of the second part of a 14-year effort to scientifically document the flood-control, water-quality and habitat benefits of wetland and prairie restoration. The results of this second, post-restoration study will be compared to the initial \$1.8-million pre-restoration hydrologic characterization to measure restoration success. Analysis of hydrologic and habitat changes resulting from wetland and prairie restoration at Glacial Ridge will identify promising restoration areas across Minnesota and quantify the benefits of restoration in those areas.

Water-quality analyses of agricultural herbicides and their metabolites were included in the 2005 pre-restoration study. Funding such sampling in the future would provide more complete understanding of water-quality benefits of wetland and prairie restorations.

2014 Detailed Project Budget

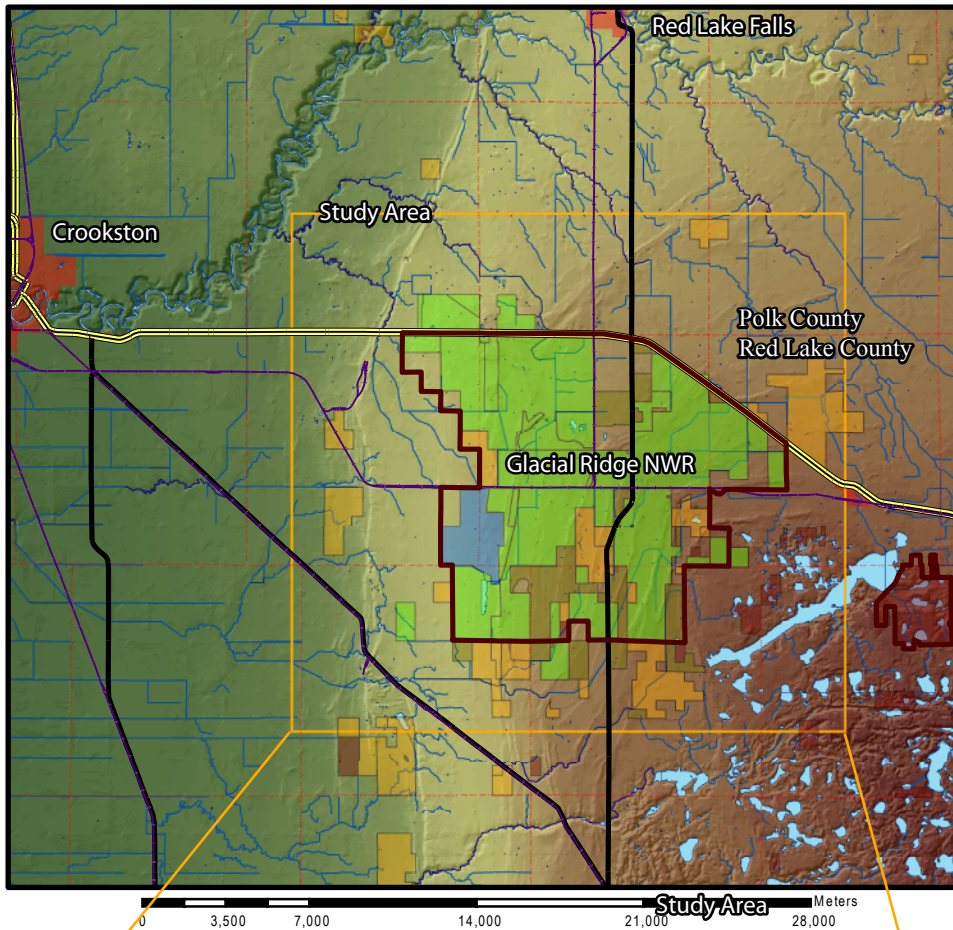
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IV. TOTAL ENRTF REQUEST BUDGET 2 years

<u>BUDGET ITEM</u>	<u>AMOUNT</u>
Personnel: 1 administrator, Red Lake Watershed District, project administration, 0.3%-time for 3 years, 75% salary, 25% benefits.	\$ 730
1 hydrologist, USGS project management and groundwater specialist, 31% time for 2 years, 75% salary, 25% benefits.	\$ 91,600
1 hydrologist, USGS surface-water specialist, 7% time for 2 years, 75% salary, 25% benefits.	\$ 23,260
	\$ 7,770
1 hydrologic technician, USGS groundwater specialist, 9% time for 2 years, 75% salary, 25% benefits,	
1 hydrologic technician, USGS surface-water specialist, 7% time for 2 years, 75% salary, 25% benefits,	\$ 9,610
Contracts: USGS groundwater hydrograph collection and processing: 3 sites	\$ 13,270
Laboratory analyses, USGS National Water-Quality Laboratory: 40 groundwater and 30 surface-water samples	\$ 8,760
Equipment: Expendable groundwater and surface-water gaging equipment: pressure transducers (1 transducers, \$1,000 each), data loggers, telecommunication equipment, etc.; water-quality sampling equipment: water-quality meters, probes, pumps, sample tubes, etc.	\$ 1,918
Supplies: Disposable sampling supplies: filters (\$21 each), bottles, preservation acid, etc.8 sampling periods, 8 samples each period.	\$ 1,694
Travel: to and from field area near Red Lake Falls, MN, 53 person days, field staff, food and lodging, \$156/day.	\$ 8,268
Vehicle fuel, based on travel estimate, 750 miles per trip, 12 trips	\$ 1,620
TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND \$ REQUEST =	\$ 168,500

V. OTHER FUNDS

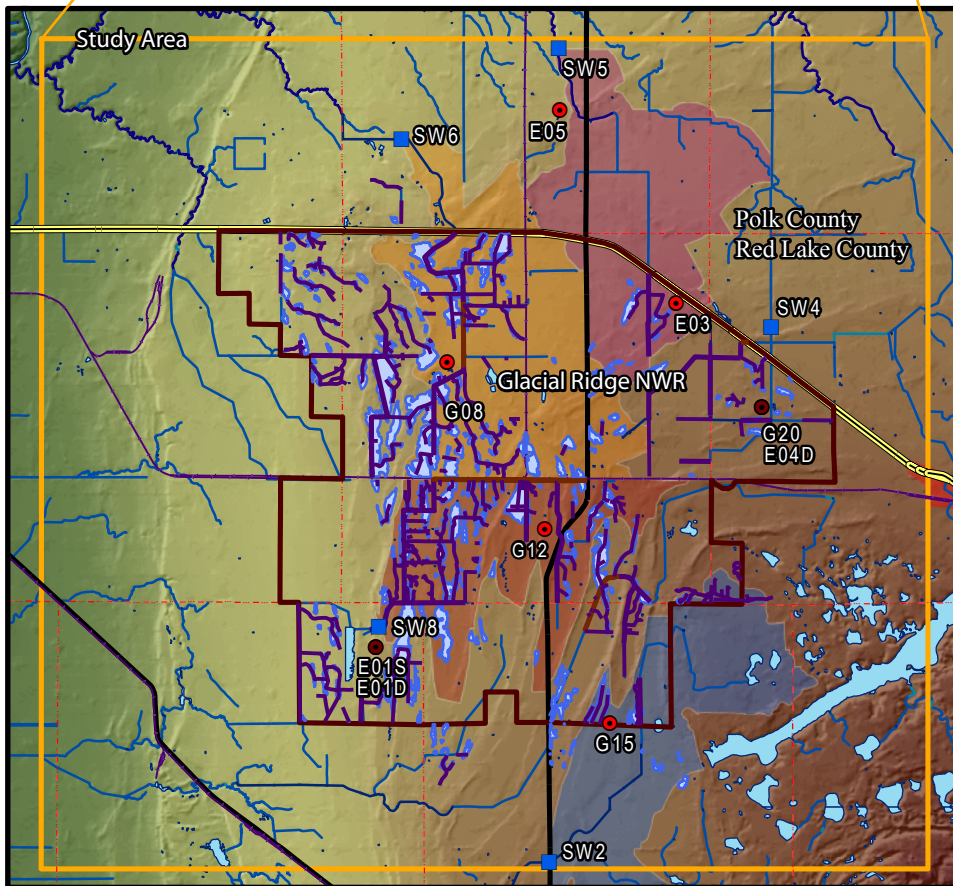
<u>SOURCE OF FUNDS</u>	<u>AMOUNT</u>	<u>Status</u>
Other Non-State \$ Being Applied to Project During Project Period: USGS cooperative program matching funds. Portion of budget items not funded by this request	\$ 84,082	Secured
In-kind Services During Project Period: U.S. Fish & Wildlife Service, hydrologic technician services	\$ 14,797	Secured
Funding History: For the post-restoration assessment: 2011-2016 Legislative and Citizen's Commission on Minnesota Resources funds: \$400,000, U.S. Fish & Wildlife Service Landscape Conservation Cooperative funds: \$200,000, USGS cooperative program matching funds: \$365,210, U.S. Fish & Wildlife Service regional funds: \$100,000, Glacial Ridge National Wildlife Refuge funds: \$30,000, U.S. Fish & Wildlife Service, hydrologic technician services: \$25,881, City of Crookston: \$1,000.	\$ 1,122,091	Secured
Pre-restoration assessment: 2002-2006 MN Pollution Control Agency: \$900,000, USGS cooperative program matching funds: \$900,000.	\$ 1,800,000	Secured



Glacial Ridge Project Area

Contiguous Conservation Lands

- Restored Glacial Ridge Lands (22,000 acres)
- Other Federal Lands (2,000 acres)
- Scientific and Natural Area (1,690 acres)
- Other State Lands (7,300 acres)
- Private (NRCS Wetland Reserve Program, 5,000 acres)



Glacial Ridge Study Area

- Well Nest
 - Well
 - Ditch Gage
 - Abandoned Ditch (126 miles)
 - Restored Wetland (8,000 acres)
- Other colored areas:
water-balance basins (22,136 acres)



Tim Cowdery

Tim Cowdery is a hydrogeologist with the U.S. Geological Survey in Mounds View, Minnesota. He currently serves as chief for several projects at the Water-Science Center in Minnesota. He earned a master's degree from the University of Minnesota in groundwater geology in 1997. His research interests include groundwater/surface-water interactions, numerical groundwater modeling, glacial geology, and groundwater recharge analysis.

Tim joined the USGS in 1992 as the groundwater specialist for the Red River of the North National Water-Quality Assessment, conducting groundwater-quality research at many spatial scales in that basin. He has designed and executed two groundwater modeling studies at local and regional scales in southwestern Minnesota and in the southern Twin Cities Metropolitan area. He has developed systems for automated groundwater data collection, telemetry, and processing and has used these data to estimate the spatial and temporal variability of groundwater recharge.

Since 2002, Tim has managed the Glacial Ridge hydrologic assessment, a groundwater/surface water interaction study that documents changes in the hydrology of a large area in northwestern Minnesota undergoing extensive wetland and prairie restorations. He continues to manage several other projects involving groundwater modeling, water-quality sampling, and groundwater recharge.