

**Environment and Natural Resources Trust Fund
2020 Request for Proposals (RFP)**

Project Title:

ENRTF ID: 117-BH

Minnesota Sentinel Springs, Understanding Groundwater Recharge and Chemistry

Category: H. Proposals seeking \$200,000 or less in funding

Sub-Category: B. Water Resources

Total Project Budget: \$ 182,267

Proposed Project Time Period for the Funding Requested: June 30, 2022 (2 yrs)

Summary:

The sentinel springs project builds foundational data necessary to increase understanding of groundwater and surface water interaction, aquifer recharge, and how changes in agricultural land management can protect water quality.

Name: John Barry

Sponsoring Organization: MN DNR

Job Title: _____

Department: _____

Address: 500 Lafayette Road

St. Paul MN 55155

Telephone Number: (651) 259-5660

Email john.barry@state.mn.us

Web Address: https://www.dnr.state.mn.us/waters/groundwater_section/mapping/index.html

Location:

Region: Southeast

County Name: Dakota, Fillmore, Goodhue, Houston, Olmsted, Wabasha, Winona

City / Township:

Alternate Text for Visual:

Image displaying locations of springs monitored in pilot project and examples of continuously collected flow, temperature, and nitrate data.

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



PROJECT TITLE: Minnesota Sentinel Springs, Understanding Groundwater Recharge and Chemistry

I. PROJECT STATEMENT

Springs provide us with measurable indicators of what is happening under the land surface and can tell us when aquifers may be in trouble. In southeastern Minnesota, many springs quickly respond to changes in precipitation, land-use activity, and pumping. Springs emerge from the same groundwater that maintains coldwater streams for trout habitat and provides nourishment to homes and businesses. Understanding how spring flow and chemistry respond to agricultural management practices is critical for measurable improvement.

The project proposes expanding data collection from a successful collaborative pilot project begun in Spring 2017 which characterized precipitation responses at eight “Sentinel Springs” in southeastern Minnesota. Initial results illustrated chemical changes in spring water after precipitation emanating from differing geologic layers and land uses. The expansion for this project would add four sites; increase data collection to 15 to 60 minute intervals, which will provide information on how quickly aquifer response and chemistry changes reach aquifers; and add project data to user friendly databases accessible to the public.

These data can help identify the most sensitive aquifers and show how practices on the surface such as the timing of surface applications and the planting of buffers and cover crops impacts groundwater. Intensive land use practices have increased the problems and the need for more information. Outcomes will provide the data necessary for water management issues such as agricultural Best Management Practices evaluation, impaired water identification and remediation, trout stream management, groundwater protection and allocation issues, and local land and water management decisions.

II. PROJECT ACTIVITIES AND OUTCOMES

Activity 1: Expansion of spring monitoring network, database development, and report publication.

Description: Work with collaborative partners and identify up to four additional spring sites in different hydrogeologic units (aquifers) to include in the network (currently eight sites). Collect and analyze spring water samples. Collect continuous data at the sites, at 15 to 60 minute intervals. Maintain, download, and manage spring flow, spring temperature, nutrient, and chemistry data from each of the spring sites into a single database. Data will go through quality assurance and quality control steps and then be uploaded into state databases available to the public. Data will be analyzed and summarized in reports, including spring flow, temperature, response to precipitation and snowmelt, chemistry, and relationships to hydrogeology and land use.

Examples of recent reports using data collected in the pilot phase of the project are listed below.

- Report: Bear Spring <https://conservancy.umn.edu/handle/11299/201602>
- Report: Crystal Creek <https://conservancy.umn.edu/handle/11299/201569>
- Presentation: Nitrate Reduction Strategies <https://conservancy.umn.edu/handle/11299/202271>

ENRTF BUDGET: \$182,267



Environment and Natural Resources Trust Fund (ENRTF) 2020 Proposal

Outcome	Completion Date
1. Identify potential springs to add based on hydrogeologic setting and land use.	June 30, 2023
2. Collect, archive, and develop database from existing springs data.	June 30, 2023
3. Measured groundwater flow from springs, collected and analyzed groundwater chemistry from springs, developed spring level and flow curves	June 30, 2023
4. Data quality assurance, quality control, and archiving	June 30, 2023
5. Peer reviewed report(s) and public presentations of project findings, increased understanding of aquifer recharge and pollution sensitivity, increased understanding of groundwater input to streams and nutrient loading to streams	June 30, 2023
6. Reviewed data and associated metadata made available to the public through existing databases. Meaningful data shared for use in improving nutrient management strategies, groundwater modeling, surface water modeling, nutrient loading calculations, and fisheries management.	June 30, 2023

III. PROJECT PARTNERS AND COLLABORATORS:

This project will expand on the existing collaborative efforts between the Minnesota DNR, Minnesota Pollution Control Agency, Minnesota Geological Survey, Olmsted County Environmental Health, and Minnesota Department of Agriculture. Each of the project partners has overlapping interest in spring behavior, aquifer characterization, and determining nutrient levels emanating from these aquifers.

Project Partners Receiving Funds:

- Minnesota Pollution Control Agency – Expertise in continuous nitrate monitoring, field installation, and data acquisition.
- Minnesota Geological Survey – Determine hydrogeologic units from which springs emerge and assist with data analysis and reporting.
- Olmsted County Environmental Health – Analyze water samples and assist with data acquisition, land owner relations, and reporting.

Project Partners Not Receiving Funds:

- Minnesota Department of Agriculture –Providing in-kind assistance with data acquisition, land owner relations, and reporting.

IV. LONG-TERM IMPLEMENTATION AND FUNDING:

The MN DNR successfully conducts groundwater and surface water monitoring across large portions of the state. However, outside of the pilot project monitoring of springs, there is no current spring monitoring in place. The successful pilot project has shown that multiple agencies and collaborators are looking for these data to better understand multiple natural resource issues. Funding this proven project will enhance fundamental understanding of groundwater characteristics, such as aquifer recharge and pollution sensitivity. Outcomes of this project will develop the data necessary for impaired water identification and remediation, trout stream management, groundwater protection and allocation issues, and local land and water management decisions.

The DNR will continue to seek external funds to increase capacity for building upon the outcomes of past, present, and future projects.

Attachment A: Project Budget Spreadsheet
 Environment and Natural Resources Trust Fund
 M.L. 2020 Budget Spreadsheet

Legal Citation: M.L. 2020

Project Manager: John Barry

Project Title: Minnesota Sentinel Springs, Understanding Groundwater Recharge and Chemistry

Organization: Minnesota Department of Natural Resources

Project Budget: \$182,267

Project Length and Completion Date:

Today's Date: April 15, 2019



ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET		Budget	Amount Spent	Balance
BUDGET ITEM				
Personnel (Wages and Benefits)-Salaries include ~15-25% fringe benefits as per state union contracts		\$ 120,500	\$ -	\$ 120,500
Hydrologist 3 (classified, 0.4 FTE)				
Hydrologist 2 (classified, 0.05 FTE)				
Hydrologist 1 (classified or unclassified, 0.1 FTE)				
Professional/Technical/Service Contracts				
MPCA- Specialty Services-continuous nitrate monitoring, field installation, and data acquisition (\$25,000)		\$ 25,000		\$ 25,000
MGS-Specialty Services- hydrostratigraphic analysis, data analysis, and reporting (\$11,000)		\$ 11,000		\$ 11,000
Olmsted County-Specialty Services-water analysis, data acquisition (\$3,200)		\$ 3,200		\$ 3,200
Equipment/Tools/Supplies				
Flow measurement and flow logging tools and pressure transducers for measuring spring level(est \$4,800 for flow meter and wading rod, est \$4,950 for flow logging system, est \$4,300 for four pressure transducers).		\$ 9,250	\$ -	\$ 9,250
Travel expenses in Minnesota				
In-state vehicle mileage (est \$2,500) and travel expenses (est \$700), primarily for water sampling and field data collection. All travel per DNR policy/commissioners plan.		\$ 3,200	\$ -	\$ 3,200
Other				
*Direct and Necessary expenses: HR Support (~\$1,686), Safety Support (~\$305), Financial Support (~\$1,591), Communication Support (~\$1,388), IT Support (~\$4,010), and Planning Support (~\$1,138) necessary to accomplish funded programs/projects.		\$ 10,117	\$ -	\$ 10,117
COLUMN TOTAL		\$ 182,267	\$ -	\$ 182,267
*Direct and Necessary expenses include Department Support Services (Human Resources, IT Support, Safety, Financial Support, Communications Support, and Planning Support). Department Support Services are described in the agency Service Level Agreement and billed internally to divisions based on rate that have been developed for each area of service. These services are directly related to and necessary for the appropriation. Department leadership services (Commissioner's Office and Regional Directors) are not assessed. Those elements of individual projects that put little or no demand on support services such as large single-source contracts, large land acquisitions, and funds that are passed through to other entities are not assessed Direct and Necessary costs for those activities.				
SOURCE AND USE OF OTHER FUNDS CONTRIBUTED TO THE PROJECT	Status (secured or pending)	Budget	Spent	Balance
Non-State:	N/A	\$ -	\$ -	\$ -
State: N/A	N/A		\$ -	\$ -
In kind: Development of pilot project, pilot project equipment, partner specialty services, water analysis, data collection, and reporting.	Secured	\$ 45,000	\$ -	\$ 45,000
In kind: MDA and county/local government assistance to arrange water sampling access, collect data, report input, and sponsor local training workshop.	pending (estimate)	\$ 8,000	\$ -	\$ 8,000
Other ENRTF APPROPRIATIONS AWARDED IN THE LAST SIX YEARS	Amount legally obligated but not yet spent	Budget	Spent	Balance
N/A				\$ -

Minnesota Sentinel Springs, Understanding Groundwater Recharge and Chemistry

John Barry, Minnesota DNR

Springs facts

- defined as locations where focused water emerges from the ground
- provide critical flow to trout streams
- flow and chemistry differs between aquifers and land use

Purpose of monitoring springs

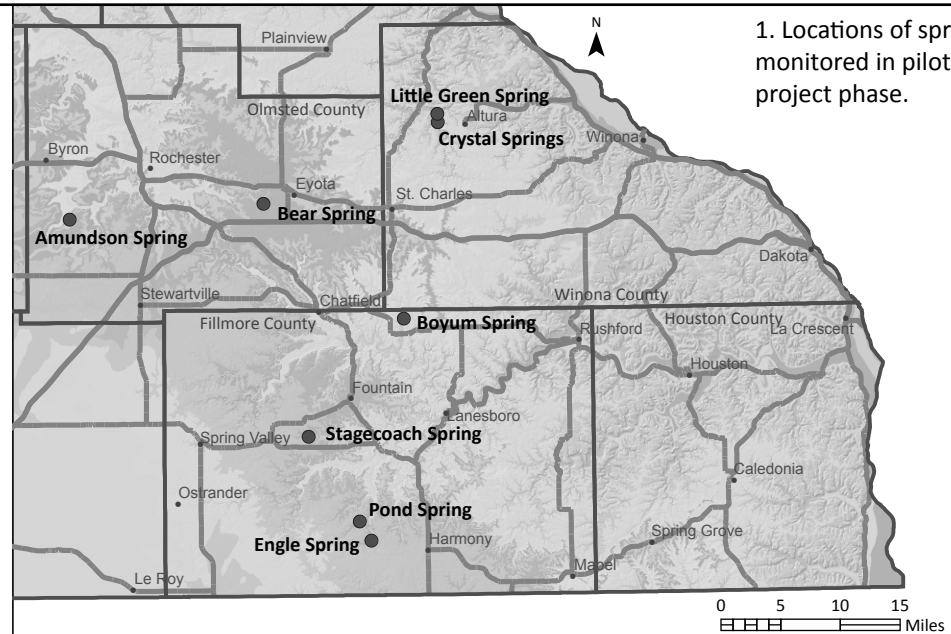
Determine:

- groundwater and surface water interaction
- aquifer recharge and chemistry
- how changes in agricultural land management can protect water quality

Project outcomes

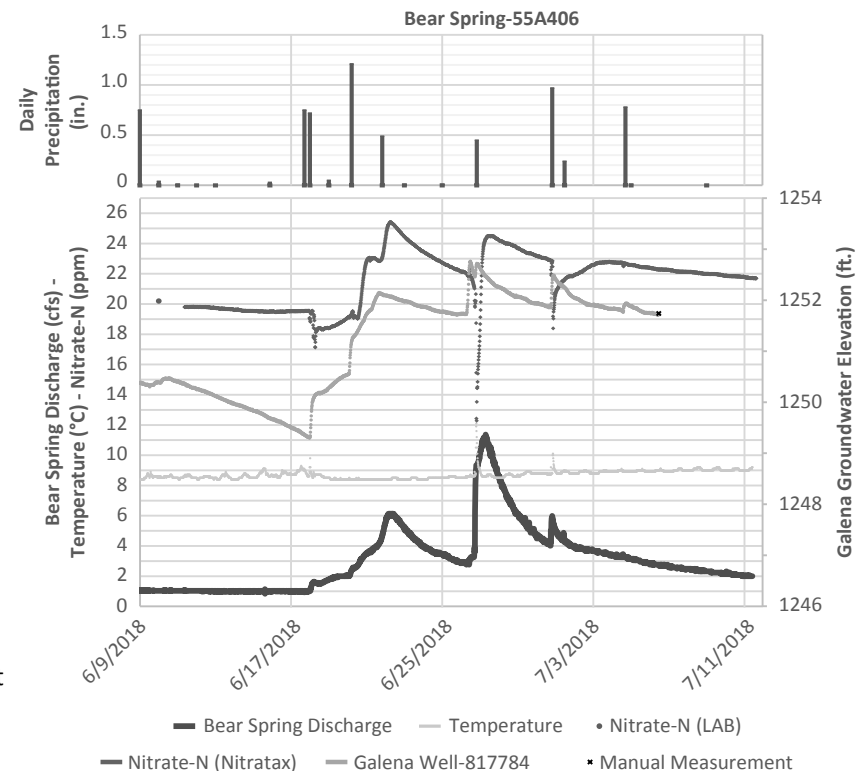
Provide the data and analyses necessary for water, land, and resource management issues such as:

- assessing agricultural Best Management Practices (BMPs)
- groundwater protection
- trout stream, fisheries, and watershed management
- impaired water identification and remediation



1. Locations of springs monitored in pilot project phase.

2. Spring hydrograph and chemograph responses to recharge events (precipitation) at pilot project spring.





Environment and Natural Resources Trust Fund (ENRTF) 2020 Proposal

PROJECT TITLE: Minnesota Sentinel Springs, Understanding Groundwater Recharge and Chemistry

Project Manager Qualifications and Organization Description

Project Manager: John Barry

Affiliation: Department of Natural Resources, Division of Ecological and Water Resources

Telephone Number: 651-259-5660

Title: Hydrologist 3

Experience

John Barry is a senior hydrologist at the Department of Natural Resources, with 15 years of experience in hydrology and project management. His current responsibilities include completing countywide aquifer-mapping projects that use geologic and geochemical data and geographic information systems (GIS) to create reports for water resource assessment and protection purposes. He also is involved in dye trace investigations, geophysical investigations, project review, project development, and project management within the County Geologic Atlas group and routinely works with collaborative partners at the Minnesota Geological Survey, Minnesota Department of Agriculture, and the Minnesota Pollution Control Agency. He received a B.S. in Geological Science, with an emphasis in hydrogeology from the University of Minnesota, Twin Cities. John's experience working with springs, environmental monitoring, aquifer chemistry, and experience as a project manager make him the ideal candidate for leading this project.

Project Responsibilities

The project manager will be responsible for: providing overall project management and technical direction for the project, coordinating with project partners, contracting for professional services in support of the project, directing the development of project reports and any other deliverables, and preparing and submitting project work plans, updates and final reports.

Organization Description

The mission of the Minnesota DNR is to work with citizens to conserve and manage the state's natural resources, to provide outdoor recreation opportunities, and to provide for the commercial uses of natural resources in a way that creates a sustainable quality of life. The DNR has extensive experience administering and coordinating projects funded by the ENRTF.