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

Project Title: **ENRTF ID: 072-B**

Banking Groundwater

Category: B. Water Resources

Sub-Category:

Total Project Budget: $ 350,000

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

Summary:

A team led by the Water Resources Center will complete an interdisciplinary analysis of the benefits and barriers to passive and active (injection) aquifer recharge in Minnesota.

Name: John Bilotta

Sponsoring Organization: U of MN - Water Resources Center

Job Title: Senior Research and Extension Coordinator

Department: CFANS

Address: 173 McNeal Hall, 1985 Buford Avenue

St. Paul MN 55108

Telephone Number: (612) 624-7708

Email jbilotta@umn.edu

Web Address: wrc.umn.edu

Location:

Region: Statewide

County Name: Statewide

City / Township:

Alternate Text for Visual:

Minnesota has limited groundwater resources. Studying the feasibility for passive and active recharge requires a comprehensive process (illustrated by the middle diagram).

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

PROJECT TITLE: Banking Groundwater

I. PROJECT STATEMENT

An interdisplinary team led by the Water Resources Center (WRC) will evaluate the engineering, hydrogeologic, economic and policy benefits of and barriers to aquifer recharge. The team will produce recommendations for recharge and how the state might proceed if recharge is needed for future water sustainability. Stakeholders will be engaged throughout the study for contributions and recommendations and results will be presented at the conclusion of the project.

For parts of Minnesota, groundwater recharge may be necessary to meet the competing needs of communities and agriculture that are expected to be exacerbated by changes in recharge that result from drainage and climate. This increases the uncertainty for a community. Options to increase water supply include conservation and reuse of water, but also recharging groundwater.

Passive aquifer recharge involves treating and directing surface water to unconfined aquifers. A more active approach is aquifer storage and recovery (ASR) through injection and recovery wells. Both methods are used around the world and have application to Minnesota.

II. PROJECT ACTIVITIES AND OUTCOMES

Activity 1: Identify areas where groundwater will be used more quickly than it is replenished based on compilation of DNR permit and water level data, climate projections, demographic data, and recharge data.

- Assemble background materials to project changes in groundwater dependence and need by assessing: a) how water is currently being used; and b) how this use might change with anticipated demographic shifts.
- Put bounds on the magnitudes of projected groundwater availability from changes to: a) the seasonality and intensity of precipitation; b) evapotranspiration; and c) hydrology.

ENRTF BUDGET: $25,000

Outcomes	Completion Date
1. Collect, compile and interpret demographic and water level data; present and report	*9/30/2021*
2. Narrow uncertainties: water balance , groundwater recharge and climate; report	*12/30/2021*

Activity 2: Characterize regionally shared aquifers for recharge and identify additional information needs.

- Identify at least 4 regionally shared aquifers that are projected to have decreasing water levels for evaluation.
- Compile existing available information including data from the county geologic atlas and develop list of characteristics for those aquifers; develop a process that describes how to obtain and compile existing data.
- Develop a methodology for estimating injection capacity of Aquifer Storage and Recovery (ASR) wells;
- Apply the developed methodology to estimate injection capacity of wells at the selected aquifers.

ENRTF BUDGET: $125,000

Outcomes	Completion Date
1. Describe regional aquifers, confined and surficial, extent, trends; present and report	*6/30/2021*
2. Identify hydrogeologic data needs, how to acquire or compile if available; report	*9/30/2021*
3. Develop understanding of recharge potential of aquifers; present and report	*12/30/2021*

Activity 3: Evaluate the environmental barriers and engineering requirements to treat water to the standard required to recharge groundwater while avoiding unwanted effects in aquifers.
Using local and regional examples of successful recharge, identify best practices for ASR required to minimize risk to groundwater quality, human health and ecosystems.

ENRTF BUDGET: $50,000

Outcome	Completion Date
1. Compile relevant case studies; present and report	*6/30/2021*
2. In selected aquifers, review geochemistry, water sources	*9/30/2021*
3. Evaluate engineering and pre-treatment options required to minimize risk; report	*12/30/2021*

Activity 4: Evaluate the economic and policy barriers to recharge.
Assess the economics for aquifer recharge and evaluate the existing policy barriers for aquifer recharge.

ENRTF BUDGET: $ 75,000

Outcomes	Completion Date
1. Determine economic conditions where recharge is feasible; present and report	*6/30/2021*
2. Assess existing rule and statute changes to implement recharge; present and report	*9/30/2021*

Activity 5: Project management, stakeholder engagement, meeting facilitation, report and dissemination

ENRTF BUDGET: $ 75,000

Outcomes	Completion Date
1. Schedule and prepare for working meetings in which subgroups report out to full group	*9/30/2021*
2. Engage broad stakeholder group with relevant experience and public	*9/30/2021*
3. Publish and disseminate report to LCCMR and legislative committees, and stakeholders	*12/30/2021*

IIIA. PROJECT PARTNERS RECEIVING ENTRF FUNDING - Name, Title, Affiliation, Role

- Jeff Peterson, Director, WRC: *Economics analysis*
- John Bilotta, Senior Research and Extension Coordinator, WRC: *Project management, policy analysis*
- Bob Tipping and Tony Runkel , Hydrologist, Minn. Geological Survey: *Aquifer and aquitard characterization*
- Bill Arnold, Faculty , CEGE, U of M: *Engineering analysis*
- Brian Bohman, Research Fellow, Freshwater Society and WRC: *Research*
- Lucia Levers, Research Associate, WRC: *Economic analysis*
- Carrie Jennings, Research and Policy Director, Freshwater Society: *Research, stakeholder engagement, facilitation*
- Peter Kang, Faculty, Earth Sciences: *Aquifer storage and recovery through wells*

IIIB. COLLABORATORS AND PARTNERS PARTICIPATING BUT NOT RECEIVING FUNDING

- Peter Boulay or Kenny Blumenfeld, State Climatologist, DNR: *Climate projections*
- Jeff Paddock or employee under Sandeep Burman, Hydrologist, MDH: *Health oversight*
- Greg Kruse or Joy Loughry, Groundwater Monitoring, DNR: *Groundwater monitoring and projections*
- Jared Troost, or Stephen M. Westenbroek, Hydrogeologists, USGS: *Water Balance projections*
- Tracy Twine, Faculty, Soil Water and Climate: *Climate projections*
- Ali El Hassan, Water Supply Planning, Metropolitan Council and Environmental Services: *Water supply projections*
- Chuck Regan, Modeler, MPCA: *Recharge partitioning (HSPF) models*

Attachment A: Project Budget Spreadsheet
Environment and Natural Resources Trust Fund
M.L. 2020 Budget Spreadsheet
Legal Citation:
Project Manager: John Bilotta and Carrie Jennings
Project Title: Banking Groundwater
Organization: University of Minnesota
Project Budget: $350,000
Project Length and Completion Date: 18 months, December 30, 2021
Today's Date: 4/2/2019

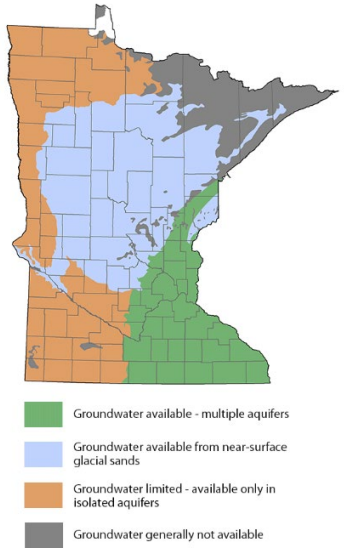
ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET		Budget	Amount Spent	Balance
BUDGET ITEM				
Personnel (Wages and Benefits)		**$ 277,159**	$ -	$ 277,159
Tony Runkel/hydrogeologist (70.50% salary, 29.5% benefits),9.533% FTE for 18 mo. 12943.63 + 3818.37	$ 16,762			
John Bilotta/project manager (64% salary,36 %benefits),8.154 %FTE for 1.5 years $25K for project management 11029.41 + 3970.59	$ 15,000			
John Bilotta/policy analysis (64% salary, 36 %benefits),6.650 %FTE for 1.5 years ($35K for policy analysis*) $8994.85 salary + 3238.15 fringe	$ 12,233			
Lucia Levers/economic analysis (64% salary, 36% benefits), 13.036%FTE for 1.5 years - $12,696.32 salary+ $4,570.68 fringe	$ 17,267			
Jeff Peterson/economic analysis (64% salary, 36% benefits), 1.382% FTE each year for 1.5 years = 3676.47+1323.53	$ 5,000			
Bob Tipping/hydrogeologist (70.50%salary, 29.5%benefits), 9.533%FTE for 18 mo. = 11889.58+3507.43	$ 15,397			
WRC Grad Student $50,500 = $22,838.40 salary + 3,676.98 fringe + Tuition $23,985 Hourly $19.52 hour fringe 16.1% (Fall 2020, Spring and Fall 2021) Total 1170 hours	$ 50,500			
Bill Arnold/engineering analysis (74%salary 36%benefits), 1.731%FTE Supervise U of MN CEGE research assistant, assist with data analysis and report writing for Year 1. 4264.71+1535.30	$ 5,800			
CEGE Graduate Student Research Assistant, (56% salary, 44% benefits) 50% FTE for year 1 Perform review to determine water quality guidelines for recharge, potential engineering issues, and analysis of water quality effects on aquifers. Tuition = $20.50 hour @780 = $15,990.00 Salary 24298.02+Fringe 3911.98	$ 44,200			
Peter Kang/aquifer recharge capacity (75%salary 25%benefits), 7%FTE 3850.74+1386.26	$ 5,237			
Earth Sciences post doc salary (81% salary, 19% benefits), 95% FTE 72214.80 + 17548.20	$ 89,763			
Professional/Technical/Service Contracts				
Freshwater Society contracted services for project management, stakeholder engagement, facilitation, and research tasks as identified in proposal and work plan. Single-source, pre selected as project partner.		**$ 72,500**		$ 72,500
Equipment/Tools/Supplies				
		$ -	$ -	$ -
Capital Expenditures Over $5,000				
		$ -	$ -	$ -
Fee Title Acquisition				
		$ -	$ -	$ -
Easement Acquisition				
		$ -	$ -	$ -
Professional Services for Acquisition				
			$ -	$ -
Printing				
			$ -	$ -
Travel expenses in Minnesota				
Parking expenses for non-University stakeholders, work group and subcommittee members at the University of Minnesota. Parking subject to all University policies.		**$ 341**	$ -	$ 341
Other				
		$ -	$ -	$ -
COLUMN TOTAL		**$ 350,000**	$ -	$ 350,000

SOURCE AND USE OF OTHER FUNDS CONTRIBUTED TO THE PROJECT	Status (secured or pending)	Budget	Spent	Balance
Non-State: Unrecovered 54% F/A minus tuition cost		**$ 167,414**	$ -	$ 167,414
State:		$ -	$ -	$ -
In kind:		$ -	$ -	$ -

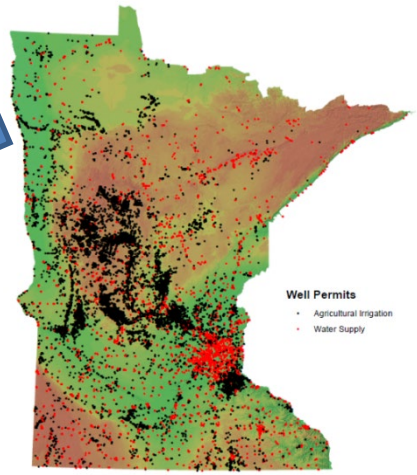
Other ENRTF APPROPRIATIONS AWARDED IN THE LAST SIX YEARS	Amount legally obligated but not yet spent	Budget	Spent	Balance
		$ -	$ -	$ -

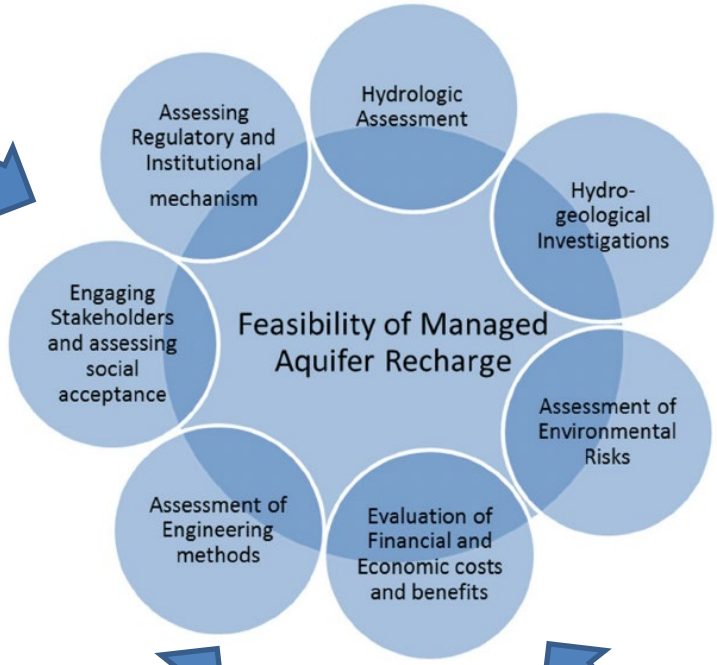
Banking Groundwater : The feasibility of groundwater recharge to meet Minnesota's future water needs

Limited aquifer area

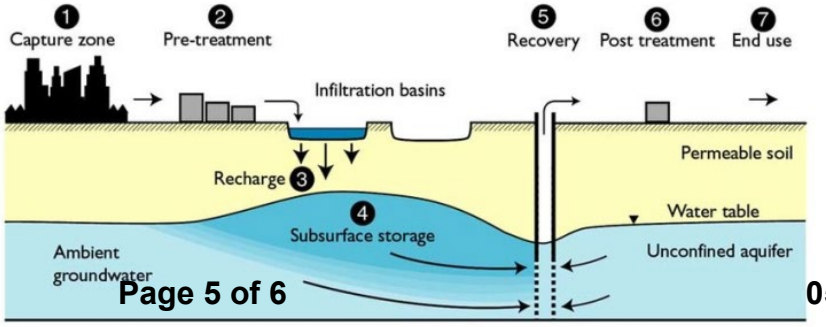


Well permits

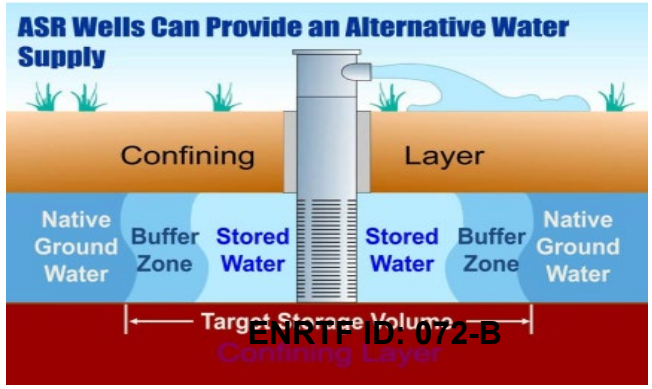




Passive infiltration to recharge aquifers



Pumping for Aquifer Storage and Recovery



Project Manager Qualifications

John Bilotta, Senior Research and Extension Coordinator
Water Resources Center, University of Minnesota

John Bilotta is the Senior Research and Extension Coordinator with the University of Minnesota's Water Resources Center where he leads the Minnesota Stormwater Research and Technology Transfer Program including leading the Minnesota Stormwater Research Council. His efforts focus on directing and coordinating a comprehensive research portfolio of projects that seek answers to questions around urban stormwater management practices and policies. John is also affiliated with the Minnesota Sea Grant Program. Prior to joining the Center, John worked for more than 21 years as an Extension Educator in Water Resource Management and Policy through a joint Extension Educator appointment with Minnesota Extension and Sea Grant. John also worked more than six years in other public and private capacities in soil and water resource management. John has a BA in Environmental Studies and Natural Resources with an emphasis in Soil Resources and M.S. in Soil Science with a focus on Fertility and Nutrient Management.

About the Water Resources Center

The Water Resources Center (wrc.umn.edu) is an interdepartmental unit of the College of Food, Agricultural, and Natural Resource Sciences and University of Minnesota Extension. It is also Minnesota's member of the National Institutes for Water Resources, giving it a Congressional mandate to conduct and organize research relevant to water resource concerns in the state. The center is the administrative home of the interdisciplinary Water Resources Science graduate program, involving over 100 faculty members spanning over 20 departments at the Twin Cities and Duluth Campuses. The center also provides professional training programs and hosts numerous events including the annual Minnesota Water Resources Conference.

About the Freshwater Society

Freshwater is a 50-year-old non-profit (501c3) working for clean and reliable water in Minnesota. Freshwater specializes in making Minnesota's groundwater supplies sustainable and preventing polluted runoff from contaminating lakes and streams. Freshwater uses education and policy to help citizens and organizations take the next step for water. The latest impact report expands on the work in FY2017

Freshwater's Stakeholder Engagement and Facilitation Approach

A critical component to ensuring success is gaining input from a broad range of stakeholders from the very beginning. Stakeholder input for planning and decision-making provides three key benefits:

- Improving the quality of information generated through collaborative input
- Enhancing the legitimacy of decisions made by increasing local buy-in
- Increasing the capacity of those involved to understand issues and move to solutions

With the urban and rural landscapes, competing uses and drivers, and varied levels of understanding of groundwater, we can expect what may be stark differences in opinions and priorities. By providing for meaningful engagement, we can surface and work through these differences to highlight many shared goals and strategies. Our team refines and finalizes the stakeholder engagement process to create genuine opportunities for input and involvement that, through transparent analysis, lead to reports that apply directly to the development of goals, objectives, and strategies for managing groundwater.