

2022 ANNUAL REPORT

Minnesota River Basin River Watch



Prepared For
MPCA & FMV





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Program Overview

River Watch (RW) engages high school, middle school, and elementary school students in a multidisciplinary study of Minnesota's water health and management through hands-on, field based experiential watershed science. Schools across the Minnesota River Basin monitor the quality of their local river and stream water resources, and investigate potential impacts to the water. The in-class and field activities are designed to prepare future scientists and stewards to understand the complex nature of water quality and advocate for solutions to improve the health of our most important resource.

Funding for River Watch during the current FY22-FY23 biennium is provided by the Minnesota Legislature through an appropriation of the Clean Water Legacy Funds to the Minnesota Pollution Control Agency. Beginning during the 2018-2019 school year with five high school teams, River Watch has grown to a program engaging eighteen high school teams. Over the 5 years River Watch has operated in the Minnesota River Basin, it has engaged an increasing number of students in water quality data collection, which is shared with the MPCA to supplement their Surface-Water Database. In 2022, River Watch Staff worked with nearly 1500 students from the following 18 high school teams, to collect water quality field data.

- Bloomington - Jefferson
- Burnsville
- Cedar Mountain
- MN Valley Izaak Walton League Green Crew Team
- Madelia
- Mankato East
- Mankato Loyola
- Minnesota Valley Lutheran
- New Ulm Cathedral
- New Ulm Public
- Prior Lake
- School of Environmental Studies
- Shakopee
- Sleepy Eye Public
- Sleepy Eye St. Mary's
- Springfield
- Tri-City United
- Waseca

Furthermore, the programming of River Watch expanded to include peer-to-peer water conservation education camps, and student-led river hikes focused on educating community members on the basics of watershed science. The expansion of activities is the result of River Watch's partnership with the Minnesota Valley Chapter of the Izaak Walton League, which provides outdoor classroom facilities, and access to the Minnesota River floodplain.

Water Quality Monitoring

Students collect and record water quality conditions of local rivers and streams using state-of-the-art YSI Sonde monitors to gather “Grab” Samples. Teams also collect and identify macroinvertebrates to further assess the health of the river or stream.



River of Dreams

Peer-to-peer education workshops through which trained high school students work with middle school and elementary school students covering a wide range of water conservation topics. The workshops focus on building water science literacy and the exploration and conservation of natural aquatic environments.



Community River Walks

High school student-led hikes, supervised by professional River Watch staff, along the floodplain of the Minnesota River aimed at educating community members on water conservation practices and human-driven impacts on the river.



Project Progress

This report is for the Minnesota River Basin River Watch Project covering January 2022 through December 2022. The Friends of the Minnesota Valley is the project sponsor with programmatic support provided by the Izaak Walton League. The remainder of this report is organized by activities undertaken in 2022.

Water Quality Monitoring

The beginning of the Spring 2022 sampling season welcomed a new Program Coordinator, Tom Crawford. In preparation for the imminent sampling, MN River Watch staff redesigned the educational materials, creating a more visually engaging and academically thorough in-class presentation (Appendix A). River Watch staff also completed the “Getting Ready for the New MN Science Standards” program offered by the Minnesota Department of Education. Every effort was made to incorporate Minnesota STEM standards into the classroom instruction and the hands-on water quality monitoring and macroinvertebrate identification (Appendix B).



The in-class lesson includes discussions on the following topics: water monitoring equipment, proper field-sampling methods, water quality measures (pH, temperature, dissolved oxygen), pollutants (nitrates, phosphates, sediment, salt), the impact of natural and constructed environments on water quality, personal water conservation measures, common macroinvertebrates, and their varying sensitivity to pollution.



Water Sampling Fieldwork

All of these topics are revisited as students participate in collecting water quality field data and making environmental observations of the surrounding riparian ecosystem. Students are separated into groups and rotate between collecting information with the various pieces of equipment.

A field sampling event includes the use of:

- YSI Sonde Handhelds - to collect water quality measures
- A Van Dorn sampler - to collect water samples from the middle of the watercourse
- A Secchi Tube - to assess the turbidity or clarity of the water sample
- A Phosphate Test Kit - to assess the level of phosphate in the water sample
- A Weighted Tape Measure - to determine the stage, or height of the water level in relation to the sampling point
- Aquatic D-Nets - to collect macroinvertebrates from the watercourse
- Macroinvertebrate Assessment Tools: Collection Tray, Taxonomy Charts, Magnifying Lens, Macroinvertebrate Pollution Sensitivity Index



Throughout May of 2022, twelve high school teams across the MN River Basin participated in 23 sampling events, monitoring waters that would offer a sharp contrast to the low water conditions following the summer's extended drought. Fall sampling added 6 more first-time River Watch teams into the program. This brought the total number of high school teams to 18 schools participating in 48 sampling events. Overall, 1484 students participated in water sampling between May and October of 2022. Friends of the Minnesota Valley is thrilled to have engaged so many young scientists and stewards in hands-on experiential learning, growing their understanding and appreciation of the complex water systems across our state and world.



River of Dreams

The Summer 2022 season marked the start of River Watch's "River of Dreams" program. The "River of Dreams" program was implemented with assistance from the Minnesota Valley Green Crew. Green Crew is a youth environmental and conservation leadership training program for high school and college students operated by the Izaak Walton League's Minnesota Valley Chapter. The Green Crew, which draws youth from five area high schools and some colleges, has its own River Watch team within the Friends of the Minnesota Valley River Watch program. Specially trained high school students from the Green Crew River Watch Team led hands-on outdoor activities and service projects for groups of elementary and middle school students who attended a "Summer at Blake" Day Camp program. "Summer at Blake" is operated by Blake School in conjunction with Breakthrough Minneapolis to engage youth across the metropolitan area in summer education.

The hands-on water science activities were scaffolded to build a base of knowledge to be expanded on each successive week. They were also designed to fulfill the Next Generation Science Standards content requirements, and structured to emphasize the three dimensions of science learning: core knowledge, scientific practices, and crosscutting concepts. In total, over 170 students attended the "River of Dreams" camps, led by 7 High School students from the Green Crew River Watch team, under the supervision of a professional River Watch staff.



Blake students exploring a wetland in the Minnesota River Floodplain



Youth Leaders relate Leave No Trace principles to water quality



Water cycle models created by Blake Students

River of Dreams (Continued)

The "River of Dreams" camp took place on the property of the Minnesota River Valley's Chapter of the Izaak Walton League. These facilities allowed students to explore the natural riparian environment and directly observe the seasonal changes in the nearby wetlands, floodplain, and river channel.

The program was so successful that four additional public elementary school camp operators have signed agreements to bring youth from their camps to the Izaak Walton League property during the summer of 2023 for a similar one day a week "River of Dreams" experience. One of these camps exclusively serves youth from a low income inner city community. The professional staff cost portion of this summer 2023 River of Dreams programming that occurs in June 2023 will be funded through the FY 2021-2023 Clean Water Fund Appropriation.



Leave No Trace Statement

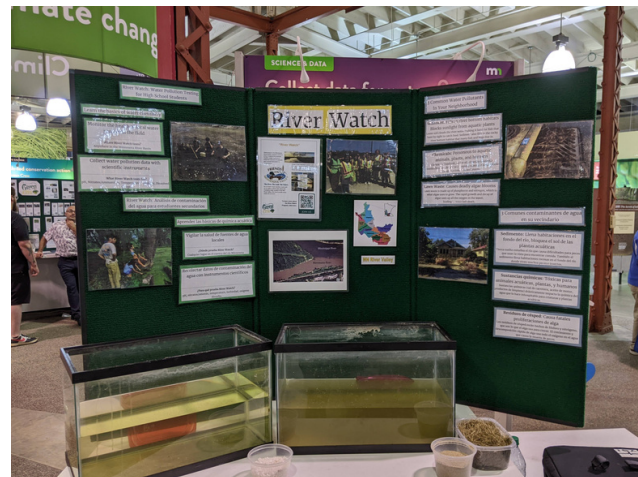
Friends of the Minnesota Valley believes the River Watch program must not only engage the scientifically minded individuals, but also the environmentally conscious ones. As such, we integrate the Leave No Trace principles into every facet of our outdoor education programs.

The seven Leave No Trace principles support ethical and environmentally conscious decision-making in both natural and constructed environments. Furthermore, Leave No Trace provides a framework for stewardship that will serve students throughout their whole personal and professional lives.

Community Engagement

In an effort to build awareness of water quality issues in the broader community, River Watch, in collaboration with the Green Crew River Watch team, hosted a number of outreach events in 2022. During the warm months, the high school students of the Green Crew River Watch team led Community River Walks; a hike along the Minnesota River from the Izaak Walton property to a MPCA testing site at the Bloomington Ferry Bridge. These events were open to the Public, which provided the Green Crew team members an opportunity to share the lessons learned from River Watch, and deepen their understanding of water science through teaching others. The aim of these River Walks was both networking with other young scientists interested in water conservation and educating community members on the importance of water quality and the extent of human's impact on our natural water resources. This Community Engagement effort reached over 30 community members across 6 River Walk events.

Presenting at the Minnesota State Fair as part of the MPCA's Eco-Experience Showcase allowed River Watch Professional Staff to interact with individuals and families across the US, prompting them to consider the health of Minnesota's largest rivers, the Mississippi and the Minnesota. Due to the geographically diverse audience, the exhibit was designed to encourage conversations around how one can reduce their impact on water quality, instead of focusing on recruitment to the program. As such, the day was filled with conversations about peoples' past and present experiences with the Minnesota and Mississippi Rivers.



Project Management & Reporting

This final 2022 report is to be submitted to the MPCA project manager. The report will also be submitted to the Board of Friends of the Minnesota Valley. Invoices have been submitted quarterly and the final summary of the project budget is shown below.

Line Item	MPCA Funds Awarded	MPCA Funds Expended	Budget Expended
Personnel	\$68,000	\$40,745.00	60%
Travel Reimbursement	\$4,000	\$3,120.20	78%
Equipment & Supplies	\$27,500	\$16,150.78	59%
Lodging & Meals	\$500	\$54.00	11%
<hr/>			
Total:	\$100,000	\$60,069.98	60%



Appendix A: 2022 River Watch Water Monitoring Participation Data

School	Sampling Events	Students Involved
Bloomington - Jefferson	1	28
Burnsville	1	17
Cedar Mountain	2	43
MN Valley Izaak Walton League Green Crew Team	6	35
Madelia	3	33
Mankato East	3	34
Mankato Loyola	4	62
Minnesota Valley Lutheran	1	18
New Ulm Cathedral	5	91
New Ulm Public	11	297
Prior Lake	17	425
School of Environmental Studies	2	54
Shakopee	6	178
Sleepy Eye Public	2	17
Sleepy Eye St. Mary's	1	7
Springfield	4	83
Tri-City United	2	45
Waseca	3	20
Totals: 18 Teams	74 Events	1,484 Students

Appendix B: Newly Developed Educational Materials

URBAN DRAINAGE SYSTEMS

Rainwater flows across impermeable surfaces: Rooftops, Sidewalks, Streets, Cars. Rainwater collects the pollutants resting on these surfaces as it travels, then drains into natural waters via storm drains along city streets.

The diagram illustrates an urban drainage system. On the left, a yellow house with a red roof is shown in cross-section. A dotted line labeled "Rain Runoff" shows water flowing from the roof into a "Sanitary Sewer" pipe. To the right, a red car is parked on a dark asphalt street. Another dotted line shows rain falling on the street and flowing into a "Storm Drain" pipe. Both pipes lead underground to a circular manhole. From the manhole, a pipe continues underground and eventually discharges into a blue river on the right. A list of "Common Pollutants in Urban Runoff" is provided in a box: Decomposing Organics (Lawn Waste), Gas/Oil, Road Salt, Fertilizers, and Trash. The background features green trees and a grey sky with rain falling.

Common Pollutants in Urban Runoff:
Decomposing Organics (Lawn Waste)
Gas/Oil | Road Salt | Fertilizers | Trash

Storm Drain

Sanitary Sewer

Rain Runoff

Common Pollutants in Urban Runoff:
Decomposing Organics (Lawn Waste)
Gas/Oil | Road Salt | Fertilizers | Trash

Storm Drain

Sanitary Sewer

Rain Runoff

AGRICULTURAL DRAINAGE SYSTEMS

The drainage system quickly moves water above and below ground away from the field to drain excess water in the soil. Rainwater collects pollutants from the surface, and is drained before it can be filtered. No water is stored in the ground, increasing the amount and velocity of the moving water which increases flood risk.

The diagram illustrates an agricultural drainage system. On the left, a red tractor is shown in a field. A dotted line shows rain falling on the "Top Soil" and flowing into a "Tile Drainage" pipe. To the right, there is a "Buffer Strip" with green bushes and a field of "Crops" (corn). Another dotted line shows rain falling on the crops and flowing into the same "Tile Drainage" pipe. The pipe runs underground and discharges into a blue river. A circular inset shows a close-up of the "Tile Drainage" tubing, which has small holes. A list of "Agricultural Surfaces" is provided in a box: Compacted Topsoil - Low Infiltration, Increased Surface Runoff/Erosion; Loose Topsoil - High Infiltration, Increased Erosion; and Vegetation - High Infiltration, Decreased Erosion. The background features green trees and a grey sky with rain falling.

Top Soil

Tile Drainage

Buffer Strip

Crops

The tile drainage tubing has little holes to allow water that has drained through the surface into the pipes.

Agricultural Surfaces:
Compacted Topsoil - Low Infiltration, Increased Surface Runoff/Erosion
Loose Topsoil - High Infiltration, Increased Erosion
Vegetation - High Infiltration, Decreased Erosion

Appendix C: Curriculum Alignment with MN's Next Generation Science Standards

Program Level	Applicable Standards	Benchmark
High School	9E.4.2.2.1	Apply place-based evidence, including those from Minnesota American Indian Tribes and communities and other cultures, to construct an explanation of how a warming climate impacts the hydrosphere, geosphere, biosphere, or atmosphere.
	9C.2.1.1.1	Analyze patterns in air or water quality data to make claims about the causes and severity of a problem and the necessity to remediate or to recommend a treatment process.
Middle School	6E.3.2.1.3	Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.
	6E.3.1.1.3	Develop a model, based on observational and experimental evidence, to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.
	7L.3.2.1.1	Construct an explanation based on evidence for how environmental and genetic factors influence the growth of organisms and/or populations.
Elementary	1E.4.2.1.1	Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.
	4E.1.2.1.1	Make observations and measurements to provide evidence of the effects of weathering or the rate of erosion by the forces of water, ice, wind, or vegetation.

Appendix D: Project Workplan



520 Lafayette Road North
St. Paul, MN 55155-4194

Friends of the Minnesota Valley Project Workplan

Doc Type: Contract

SWIFT Contract number:
Purchase Order number:
Agency Interest ID:191308
Activity ID:PRO20210001

Project title: Friends of the MN Valley River Watch

1. Project summary:

Organization: Friends of the MN Valley
Contractor contact name: Thomas Crawford
Title: Project Coordinator
Address: 6601 Auto Club Rd Bloomington, MN
Phone: 55438 (763)-656-9179
Email: tom@friendsmnvalley.org

MPCA project manager: Kelly O'Hara
Title: Program Coordinator
Phone: (651) 757-2226
Email: kelly.ohara@state.com

Project information

Counties: Blue Earth, Carver, Chippewa, Cottonwood, Dakota, Hennepin, Lac qui Parle, Lyon, Martin, Nicollet, Renville, Scott, Sibley, Swift, Waseca, Watonwan, Yellow Medicine.
Start date: 09/20/21 End date: 06/30/2023
Total cost: \$100,000.00
Full time equivalents: 1.4

Major watershed(s):

<input checked="" type="checkbox"/> Chippewa River	<input checked="" type="checkbox"/> Lac qui Parle	<input checked="" type="checkbox"/> Pomme de Terre	<input checked="" type="checkbox"/> Yellow Medicine River	<input checked="" type="checkbox"/> Hawk Creek
<input checked="" type="checkbox"/> Redwood River	<input checked="" type="checkbox"/> Cottonwood River	<input checked="" type="checkbox"/> Watonwan River	<input checked="" type="checkbox"/> Le Sueur River	<input checked="" type="checkbox"/> Blue Earth River
<input checked="" type="checkbox"/> Middle MN River	<input checked="" type="checkbox"/> Lower MN River			

Organization ☒ Non-profit

type: Project type: ☒ Education/Outreach/Engagement ☒ Monitoring ☒ Research

Brief project summary

River Watch (RW) enhances watershed understanding and awareness for tomorrow's decision-makers through direct hands-on, field-based experiential watershed science. High School based teams throughout the Minnesota River Basin participate in a variety of unique and innovative watershed engagement opportunities such as Water Quality Monitoring and Macroinvertebrate surveys that are suited to their school, community, and watershed needs.

Goal of project

Provide classroom instruction and a hands-on learning experience on water quality and water quality monitoring to 16 high school based teams during the 2021-2022 school year and 20 high school based teams during the 2022-2023 school year. These students, tomorrow's adult citizens and decision makers, will learn about water quality, science skills, and the importance of water quality.

2. Workplan Detail/Measurable Outcomes

OBJECTIVE 1: Develop and Implement Science, Technology, Engineering, and Mathematics (STEM) Curriculum for River Watch Team Water Quality and Macroinvertebrate Monitoring Programs. Curriculum to Include MPCA Water Quality and Macroinvertebrate Standard Operating Procedures.

Task 1. Implement STEM education into professional teacher development training in the 2022-2023 program year.

Provide professional teacher development on Water Quality Monitoring and Macroinvertebrate Monitoring through one-on-one training sessions between teachers and FMV staff during fall of 2021. Regional summer or fall kick-off training in summer/fall of 2022.

- *Measurable Outcome 1; Develop and secure a STEM curriculum suitable for training teachers of High School level, Middle School level, and Elementary School level education. Completed May 2022 (Elementary/Middle School) Completed December 2022 (High School)*
- *Measurable Outcome 2; 16 teachers trained. At least one teacher in each of 16 different teams will be engaged in and complete a River Watch Training session during late summer/early fall of 2021. Completed August 2022. Measurable Outcome 3: 20 teachers trained. At least one teacher in each of 20 different teams will be engaged in and complete a River Watch Training session during late summer/early fall of 2022.*

Task 2. Utilize STEM curriculum while engaging 16 River Watch Teams during the 2021-2022 school year in at least four monitoring events during the school year and engaging 20 River Watch Teams in at least four monitoring events per team during the 2022-2023 school year.

- *Measurable Outcome 1; 16 teams will be recruited and will participate in four Water Quality and Macroinvertebrate monitoring events during 2021-2022. Completed June 1, 2022.*
- *Measurable Outcome 2; 20 teams will be recruited and will participate in four Water Quality and Macroinvertebrate monitoring events during 2022-2023. Completed June 1, 2023.*
- *Measurable Outcome 3; Water Quality monitoring data will be submitted to MPCA for each of the planned 64 monitoring events in 2021-2022. Completed November 2022.*
- *Measurable Outcome 4: Water Quality monitoring data will be submitted for each of the planned 80 monitoring events in 2022-2023.*
- *Data submittal will be completed using the EQuIS platform by 11/1/21, 11/1/22 and 6/30/23 respectively.*

OBJECTIVE 2: Development of Elementary/Middle School River Education Program

Task 1. Design and test implement an elementary and middle school component (possibly River of Dreams) that engages High School River Watch students in teaching younger students.

- *Measurable Outcome 1; Identify and secure a curriculum suitable for use by High School team members teaching younger students. Completed January 1, 2022.*
- *Measurable Outcome 2; Create and share media from educational events via River Watch website and social media, these posts can include photo images, maps, and participant observations at least 1 time per month. In Progress January 2023.*

Task 2. Secure Participation and Implement Elementary and Middle School Program Components.

- *Measurable Outcome 1; During the 2021-2022 school year, test and implement the elementary/middle school program in at least 4 schools. Completed June 2022.*
- *Measurable Objective 2; During the 2022-2023 school year, implement the elementary/middle school program in at least 10 schools. Completed June 2023.*

Objective 3: Project Oversight, Reporting, and Invoicing

Task 1. Track project grant-related expenditures. Compile and organize invoices, pay bills and submit for expense reimbursements in a timely manner.

- *Grant-related expenditures tracked, bills paid, and expense reimbursements submitted quarterly at minimum.*

Task 2. Track objectives, tasks, and FTE to ensure outcomes are being met. Prepare and complete reports and results from the program as follows:

- *Interim report and initial evaluation to MPCA, Legislative and Education Committees by February 15, 2023.*
- *Final report of project outcomes, budget/FTE, and final evaluation results by June 15, 2023 to all entities who are receiving the February 15, 2023 report noted above.*
- *Annual site visit with MPCA project manager completed by spring 2022 and spring 2023.*

3. Project Budget

Staff total cost*		\$68,000.00
Travel reimbursement**	-	\$14,000.00
Travel reimbursement**		\$4,000.00
Equipment, supplies, and shipping (see detailed list below)	-	\$16,000.00
Equipment, supplies, and shipping (see detailed list below)		\$27,500.00
Nb-		\$2,000.00
Meals***		\$500.00
	Total:	\$100,000.00
Estimated FTE:1.4(Final Report shall include actualFTE)		
* Staff rates shall not exceed the following:		
Staff 1 rate: Project Coordinator	\$ 30.00	
Staff 2 rate: Contracted Area School Monitoring Coordinator (4 staff)	\$ 25.00	
Staff 3 rate: Contracted Project Fiscal and Accounting	\$ 25.00	

**Mileage billed at current IRS Mileage Rate

*** Meals billed at current Commissioner's Plan Rate

Equipment and Supplies List			
Equipment - limited to items greater than \$500 with a life expectancy greater than 1 year	Quantity needed	Unit Cost	Total Cost
YSI Sonde Monitor with Probes	2	\$5,500	\$11,000
Supplies (Field and Safety) - items less than \$500 Consumable chemicals, replacement parts, shipping.			\$5,000
Total:			\$16,000