

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

Project Title:

ENRTF ID: 110-B

Increased Sample Capacity for Analysis of Pesticides

Category: B. Water Resources

Sub-Category:

Total Project Budget: \$ 736,079

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

Summary:

Updating the MDA Laboratory pesticide analytical equipment with the latest technology will increase the capacity for analyzing pesticide water samples and increase the number of pesticides measured per water samples.

Name: Heather Johnson

Sponsoring Organization: Minnesota Department of Agriculture

Job Title: Senior Hydrologist

Department: _____

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Location:

Region: Statewide

County Name: Statewide

City / Township:

Alternate Text for Visual:

The figure shows the dramatic increase in number of pesticides samples analyzed when acquiring new technology and how number of individual pesticides analyzed for also rises with new technology.

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



PROJECT TITLE: Increased sample capacity for analysis of pesticides

I. PROJECT STATEMENT

The Minnesota Department of Agriculture (MDA) is responsible for monitoring and investigating pesticides that may threaten Minnesota’s water resources. This project will provide funding for the MDA Laboratory Services Division (MDA Lab) to acquire the most technologically advanced instrumentation for the analysis of pesticides in water samples. When fully operational with two machines (the second machine secured using other funding sources), this new methodology is anticipated to expand the capacity of the MDA Lab to analyze more samples (up to 267 additional samples per year when fully functional with both instruments) and analyze for more pesticides in each water sample. This method includes the neonicotinoid pesticides (including imidacloprid and its two breakdown products imidacloprid-olefin and imidacloprid-urea). The increased sample capacity will provide additional information about the presence of pesticides (such as breakdown products of atrazine, acetochlor, chlorpyrifos, metolachlor and many others) in groundwater and surface water in Minnesota.

ACTIVITY 1: Purchase of instrument to increase sample capacity and number of pesticides analyzed.

The MDA Lab will solicit bids for the purchase of the LC-MS/MS direct inject instrument using the state procurement process to ensure maximum features and quality for the available funding. A five year service warranty, purchased upfront at a large discount, would be included with the instrument purchase and is listed separately on the budget spreadsheet. One Environmental Analyst FTE (unclassified) is proposed to assist the MDA Lab during the one year method development process. It is anticipated that the new instrument and method will:

- Eliminate the lengthy extraction times for the current MDA LC-MS/MS method, improving efficiency and reducing costs;
- Require smaller sample volume from the current 1 liter to 20-30 milliliters, saving costs on bottles and shipping;
- Improve method efficiency by reducing pesticide loss that can occur during extraction process;
- Allow for the addition of new pesticides; and
- Reduce the volume of wastewater that is generated during the extraction process.

Throughout the summer of 2021, this instrument will be run in conjunction with the older LC-MS/MS machines to compare results and evaluate performance. It is anticipated that the instrument will be validated and ready to analyze samples starting in 2022. A summary report detailing the Activity Outcomes will be prepared upon completion of the analytical method development.

ENRTF BUDGET: \$736,079

Outcome	Completion Date
<i>1. Solicit, evaluate bids and purchase for LC-MS/MS direct inject purchase and five year service contract</i>	<i>September – November 2020</i>
<i>2. Setup of LC-MS/MS direct inject Instrument, software installs and chemist training</i>	<i>Feb – May 2021</i>
<i>3. Finalize pesticide analysis list and fine tune instrument</i>	<i>May 2021 – Dec 2021</i>
<i>4. Determine sample increase in capacity</i>	<i>Jan 2022</i>
<i>5. Fully operational for 2022 water sampling season</i>	<i>Feb 2022</i>

ACTIVITY 2: Reporting of results on expanded sample capacity and increased pesticide analysis.

Starting in the spring of 2022, the new instrument and method will be used by MDA for analysis of surface and groundwater samples collected across the state, with an anticipated 917 LC-MS/MS samples to be submitted in 2022, an increase of 267 samples from 2019. This will include coordinating with the Minnesota Department of Health (MDH) on the collection of 100 water samples from Community Public Water Supply systems across Minnesota, similar to past efforts in 2010 and 2015. A summary report providing details on all of the Activity Outcomes will be submitted within 30 days of the completion date.

Outcome	Completion Date
1. Begin routine sample analysis	March 2022
2. Community Public Water Supply Reconnaissance with MDH	March 2022
3. Expanded capacity and efficiency evaluation final report	June 30, 2022

III. PROJECT PARTNERS AND COLLABORATORS:

Who are the project partners and collaborators? Only include committed partners and collaborators.

A. Partners receiving ENRTF funding

Name	Title	Affiliation	Role
Kathy Reynolds	Analytical Supervisor	MDA Lab	PI
Heather Johnson	Hydrologist	MDA Monitoring Unit	Project Manager
Bill VanRyswyk	Hydrologist Supervisor	MDA Monitoring Unit	Co-PI
Cathy Villas-Horns	Hydrologist Supervisor	MDA Incident Response Unit	Co-PI

B. Partners NOT receiving ENRTF funding

Name	Title	Affiliation	Role
Steve Robertson	Hydrologist Supervisor	MDH	Technical advisor

LONG-TERM IMPLEMENTATION AND FUNDING:

If the initial LC-MS/MS direct inject method development is successful, the MDA will leverage this success to secure a second instrument from other funding sources. This will allow MDA to fully convert the LC-MS/MS water analysis methods to a direct inject platform. Combined with dedicated funds from MDA and supplemental funds received from the Clean Water Land and Legacy Act for staffing and support, it is anticipated that the equipment purchased through this project will continue to meet Minnesota's pesticide water monitoring needs for at least a decade. The current LC-MS/MS machines will be transitioned for high level incident response or misuse water samples. Each year the target pesticide list will be reviewed and appropriate adjustment made based upon changing pesticide use, environmental fate and toxicity information and the previous year's pesticide detection patterns. The successful implementation of this project will allow Minnesota to continue as a national leader in the area of pesticide water quality monitoring. The project is proposed to last 2 years, July 2020 – June 2022.

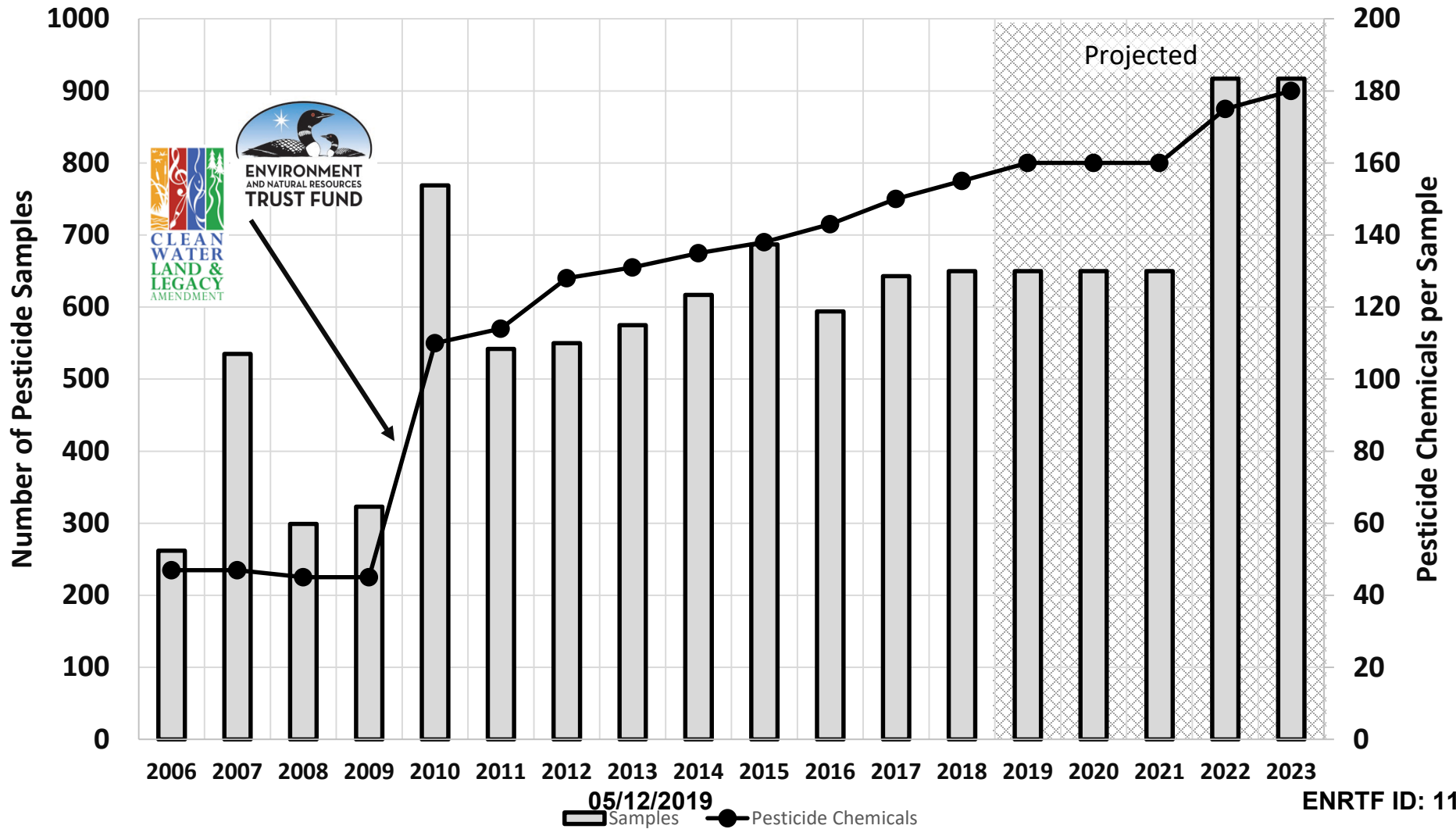
Attachment A: Project Budget Spreadsheet
 Environment and Natural Resources Trust Fund
 M.L. 2020 Budget Spreadsheet



Legal Citation:
 Project Manager: Heather Johnson
 Project Title: **Increased sample capacity for analysis of pesticides**
 Organization: Minnesota Department of Agriculture
 Project Budget: \$736,079
 Project Length and Completion Date: 2 years, June 30, 2022
 Today's Date: April 15, 2019

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET		Budget	Amount Spent	Balance	
BUDGET ITEM					
Personnel (Wages and Benefits) unclassified position		\$ 73,700	\$ -	\$ 73,700	
<i>salary (\$53,700)</i>					
<i>Fringe (\$20,000)</i>					
<i>This is a one year Environmental Analyst FTE position. The person in this position will work on tasks related to method development with the LC-MS/MS.</i>					
Professional/Technical/Service Contracts					
Five year Service Contract to provide		\$ 150,909	\$ -	\$ 150,909	
<i>(Cost savings of \$26,631 by paying for it upfront)</i>					
Analytical Supplies		\$ 12,000	\$ -	\$ 12,000	
<i>LC Syringes (\$1,200)</i>					
<i>LC filters (\$6,600)</i>					
<i>LC columns (\$2,200)</i>					
<i>Inline Filters (\$2,000)</i>					
Capital Expenditures Over \$5,000					
LC-MS/MS direct inject instrument for analysis of pesticides in water		\$ 499,470	\$ -	\$ 499,470	
<i>The MDA Lab will send spiked water samples to multiple vendors to evaluate their instrument performance and obtain quotes for instrumentation costs. Based upon test results, the MDA Lab will solicit bids for the purchase of the LC-MS/MS direct inject instrument using the state procurement process to ensure maximum features and quality for the available funding. The selected bidder will build the instrument to the MDA Lab exact specifications.</i>					
COLUMN TOTAL		\$ 736,079	\$ -	\$ 736,079	
SOURCE AND USE OF OTHER FUNDS CONTRIBUTED TO THE PROJECT					
	Status (secured or pending)	Budget	Spent	Balance	
State: MDA dedicated funding for Lab analyst method development.		secured	\$ 100,000	\$ -	\$ 100,000
State: MDA dedicated funding for sample collection (400 samples @ \$90).		secured	\$ 36,000	\$ -	\$ 36,000
<i>The MDA will also use existing resources for method development at the MDA Lab and will provide personnel and supplies for sample collection during the evaluation period.</i>					
In kind:		\$ -	\$ -	\$ -	
Other ENRTF APPROPRIATIONS AWARDED IN THE LAST SIX YEARS					
	Amount legally obligated but not yet spent	Budget	Spent	Balance	
		\$ -	\$ -	\$ -	

Annual MDA LC-MS/MS Samples and Number of Pesticides Analyzed per Sample



Project Manager Qualifications

Heather Johnson currently serves as a Senior Hydrologist with the Minnesota Department of Agriculture (MDA). She earned her BA in Environmental Studies from University of Minnesota – Duluth, and her MS in Water Resources Science from the University of Minnesota – Twin Cities. She has worked at multiple levels of government, including a Joint Powers Board, the Metropolitan Council, the National Weather Service and over 12 years at MDA.

Heather has been with the MDA for over twelve years, serving as both a hydrologist and for several years, Supervisor of the Monitoring and Assessment Unit, until taking a reduction in work hours to be home with her kids. She is currently a Senior Hydrologist, working on a large range of complex projects. She has successfully managed several large MDA Clean Water Fund Research Projects, providing oversight to outside contractors to ensure projects are completed on time, appropriate reports are submitted and the projects are held accountable on project goals and objectives. Each year she successfully leads a team of hydrologists in pulling together the MDA's Water Quality Monitoring Report, a compilation of the previous year's pesticide water quality data. She is Project Manager for Minnesota's Runoff Risk Advisory Forecast (www.mda.state.mn.us/rraf) a tool designed to help farmers and commercial applicators determine the best time to apply manure. It is part of a regional Runoff Risk Advisory Forecast project which includes state and federal agencies in Wisconsin, Michigan, Minnesota and Ohio.

Organization Description:

Ambient water quality monitoring is conducted by the MDA Monitoring and Assessment Unit to evaluate the impact of agricultural chemicals, including pesticides and fertilizers, on groundwater and surface water from routine application. The data collected is used to identify compounds and/or places where concentrations may exceed established water quality benchmarks, guidance values, and/or standards, collectively referred to as reference values. This data is also used to identify trends regarding detection frequency and concentration of specific agricultural chemicals found in the waters of the state. The data can also prompt development, and the evaluation of effectiveness of best management practices (BMPs) for those specific compounds. The groundwater and surface water monitoring networks have evolved over the years to meet the needs of the state. The ambient water quality data collected is public information and is available by request or through the Water Quality Portal.

Guided by the Pesticide Control Law and the Comprehensive Groundwater Protection Act (Minnesota Statutes 18B, 18C, 18D, and 103H) and the MDA's Pesticide Management Plan, the activities of the Monitoring and Assessment Program focus on:

- The collection and analysis of water samples from multiple locations throughout the agricultural and urban areas of the state to determine the identity, concentration magnitude and the frequency of pesticide presence in Minnesota's groundwater and surface water resources.
- Assessment of the long-term impacts of normal pesticide use on waters within the state.
- Conducting intensive monitoring of specific areas that are more sensitive to pesticide contamination based on geology, pesticide usage or based on historical data.
- Providing data to guide activities in the Pesticide Management Plan, including the development of best management practices to minimize the impacts of pesticide application to water resources.