



# Environment and Natural Resources Trust Fund

## 2021 Request for Proposal

### General Information

**Proposal ID:** 2021-047

**Proposal Title:** Updating Pesticide Analytical Capabilities to Protect Minnesota Waters

### Project Manager Information

**Name:** Heather Johnson

**Organization:** Minnesota Department of Agriculture

**Office Telephone:** (651) 201-6098

**Email:** heather.johnson@state.mn.us

### Project Basic Information

**Project Summary:** This project will increase pesticide analysis capabilities of the MDA Lab. A recent recommendation from Legislative Auditor Office directed MDA to look for more pesticides in the waters of Minnesota.

**Funds Requested:** \$3,000,000

**Proposed Project Completion:** 2023-06-30

**LCCMR Funding Category:** Water Resources (B)

### Project Location

**What is the best scale for describing where your work will take place?**

Statewide

**What is the best scale to describe the area impacted by your work?**

Statewide

**When will the work impact occur?**

During the Project and In the Future

## Narrative

### **Describe the opportunity or problem your proposal seeks to address. Include any relevant background information.**

In March of 2020, the Office of the Legislative Auditor (OLA) released a program audit of the Minnesota Department of Agriculture (MDA) pesticide programs. The OLA recommended the MDA expand its pesticide monitoring to include additional chemicals. Analyzing for these chemicals will require significant upgrades at the MDA Laboratory Services Division (MDA Lab) to replace aging equipment. Coupled with this is the need to run more samples for neonicotinoids and the degradates of cyanazine, both of which are emerging concerns for water resources in Minnesota. Surface water sampling results from 2019 indicate some samples exceeded the EPA aquatic life benchmarks for neonicotinoid insecticides, which are known risks for pollinators. In groundwater, the degradates of the herbicide cyanazine were detected in 2019 in over 40 private wells at levels above drinking water standards. Although cyanazine has not been used in Minnesota since 2002, the presence of these degradates in groundwater at concentrations of concern amplifies the urgency for the MDA Lab to provide reliable analysis of samples from private and municipal drinking water wells. The MDA Lab is one of only three labs in the nation capable of analyzing water samples for the degradates of cyanazine.

### **What is your proposed solution to the problem or opportunity discussed above? i.e. What are you seeking funding to do? You will be asked to expand on this in Activities and Milestones.**

This project requests four LC-MS/MS to replace aging analytical instruments which are breaking down due to their age and to increase the capacity and capability of the MDA Lab. The new equipment will provide an increased sample capacity and allow MDA to analyze for pesticides that are currently not feasible with existing equipment. When fully operational, the four LC-MS/MS equipment will provide the following:

1. Two LC-MS/MS machines will replace old instruments which are wearing out and breaking down, including one of them had a four-month period from November 2019 to February 2020 where it was inoperable and caused considerable backlog.
2. The third machine will replace another aging and problematic instrument. It will provide a dedicated system for glyphosate analysis and expanded capabilities to analyze for the herbicide glufosinate identified in the OLA Audit.
3. The fourth LC-MS/MS will be used to develop methods and to target pesticide chemicals that are not conducive to the current MDA methods including potato fungicides identified in the OLA Audit.

### **What are the specific project outcomes as they relate to the public purpose of protection, conservation, preservation, and enhancement of the state's natural resources?**

With this funding, valuable information on the extent of pesticide presence such as neonicotinoids, glyphosate, cyanazine degradates, and other pesticides of concern in Minnesota's waters will be obtained. This information will be used to collect more samples for surface water impairment assessment, additional capacity for public and private drinking water analysis and provide needed information for MDA to effectively manage specific pesticides. These actions will allow for collection of high-quality pesticide data offering public health and aquatic resource protection over the next decade.

## Activities and Milestones

**Activity 1: Purchase of instruments to replace aging equipment and offer advancements in pesticide analysis.**

**Activity Budget:** \$2,593,435

**Activity Description:**

The MDA Lab will solicit bids for the purchase of four LC-MS/MS instruments using the state procurement process to ensure maximum features and quality for the available funding. A two-year service warranty, purchased at a large discount, would be included with the instrument purchase and is listed separately on the budget spreadsheet. Four extractors would also be purchased to allow for increased capacity (approximately 500 samples) on the new instruments. It is anticipated that the new and updated instruments and methods will:

- Allow for additional chemicals to be added to existing MDA LC-MS/MS method.
- Address recommendations by the Office of the Legislative Auditor for analysis of specific pesticide chemicals which MDA Lab does not have capability to do currently.
- Reduce delays in sample analysis due to breakdowns of aging equipment.
- Allow for analysis of analytes that have unique chemistry and extraction requirements that are not possible with current MDA LC-MS/MS methods or equipment.

**Activity Milestones:**

Description	Completion Date
Solicit, evaluate bids and purchase for four LC-MS/MS, four extractors and two-year service contract	2021-11-30

**Activity 2: Analyzing samples and reporting of results for cyanazine degradates, neonicotinoids and other pesticides including those requested in the OLA Audit.**

**Activity Budget:** \$406,565

**Activity Description:**

Two Environmental Analysts (unclassified) are proposed to assist the MDA Lab during the method development process. Additional funds are requested to support both the Forensic Evidence Specialist and Quality Officer for additional work load generated with more samples and new equipment. The new instruments and methods will be used by MDA for analysis of surface and groundwater samples collected across the state, with an anticipated increase in LC-MS/MS samples to be submitted in 2022 and further increased in 2023. This will include coordinating with the Minnesota Department of Health (MDH) on the collection of 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.

**Activity Milestones:**

Description	Completion Date
Installation and validation of new extractors, positions hired and trained, setup and validation for equipment	2022-03-31
2 LC-MS/MS Ready for new analytes and additional samples for core sample analysis	2022-04-30
2 LC-MS/MS Setup of equipment, software installation and chemist training.	2022-12-31
All 4 LC-MS/MS Fully operational for 2023 water sampling season	2023-03-31
Community Public Water Supply Reconnaissance with MDH	2023-03-31
Updating Pesticide Analytical Capabilities to Protect Minnesota Waters evaluation final report	2023-06-30



## Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Steve Robertson	Minnesota Department of Health	Technical Advisor and will help in coordinating collection of 100 water samples from Community Public Water Supply systems across Minnesota, similar to past efforts in 2010 and 2015.	No

## Long-Term Implementation and Funding

**Describe how the results will be implemented and how any ongoing effort will be funded. If not already addressed as part of the project, how will findings, results, and products developed be implemented after project completion? If additional work is needed, how will this be funded?**

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 negative mode machines will be transitioned to incident response or misuse water samples. Each year the target pesticide list will be reviewed, and appropriate adjustments made based upon changing pesticide use, environmental fate and toxicity information and the previous year's pesticide detection patterns.

## Project Manager and Organization Qualifications

**Project Manager Name:** Heather Johnson

**Job Title:** Hydrologist 3

**Provide description of the project manager's qualifications to manage the proposed project.**

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 13 years at MDA.

She has worked both as an 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, provided oversight to outside contractors to ensure projects were completed on time, appropriate reports were submitted, and the projects were 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](http://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:** Minnesota Department of Agriculture

**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. The MDA is 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.

## Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	\$ Amount
<b>Personnel</b>								
Environmental Analyst 1		This position will be responsible for water samples to be analyzed by LCMSMS. Duties will include: performing standard validation, method development and validation, extraction and data analysis of water samples, and written documentation of all procedures following ISO17025 requirements.			34.5%	2		\$380,365
Quality Officer		This position is part of the Lab's Quality Assurance Unit and will be responsible for supporting activities related to the additional LCMSMS methods that will be added to the scope of the lab's ISO17025 accreditation. Duties will include performing internal audits of new methods for direct inject analysis, glufosinate and other methods that will require unique chemistry methods, providing assistance for quality control charts, measurement uncertainty calculations, and evaluation of PT (performance testing) samples.			43%	0.1	X	\$12,036
Forsensic Evidence Specialist		This position is part of the lab Operation Unit and will be responsible for supporting activities related to the additional LCMSMS samples. Duties include logging in samples, maintaining chain of custody, storage of samples, purchasing supplies, and instrument purchases / service contracts.			38%	0.2	X	\$14,164
							<b>Sub Total</b>	<b>\$406,565</b>
<b>Contracts and Services</b>								
TBD	Professional or Technical Service Contract	Provides 2 year full service coverage contract for LC MS/MS (4) and Autotraces Extractors(4) to cover repairs and technical issues. Contracts are vendor specific for each associated piece of equipment.				0		\$277,756
TBD	Professional or Technical	There will be a need for software to analyze data from the new LCMSMS instruments. The software				0		\$16,420

	Service Contract	includes licenses for Waters MassLynx (2 licenses) and Agilent Mass Hunter (1 license).						
							<b>Sub Total</b>	<b>\$294,176</b>
<b>Equipment, Tools, and Supplies</b>								
	Tools and Supplies	This is list of analytical supplies to be used with the LC-MS/MS equipment. LC Syringes (\$1,200) LC filters (\$6,600) LC columns (\$2,200) Inline Filters (\$2,000) LC/MS Water (\$1,500) Methanol (\$650) LC Vials (\$6,500) Other consumables (\$5,038) Freight (\$1,000)	Consumable costs for 4 instruments over 2 years. Method development will require testing of different LC columns and specific analytes requiring unique methods will need additional consumable solvents, LC fittings, and specialized lab glassware.					\$53,338
							<b>Sub Total</b>	<b>\$53,338</b>
<b>Capital Expenditures</b>								
		LC-MS/MS instrument for analysis of pesticides in water	This project requests four LC-MS/MS instruments to 1) increase analyte and sample capacity of our large screen LC method. 2) New instruments are needed to replace aging analytical instruments which are breaking down because of their age and causing delays in analysis and 3) The new instruments will also be used to add new capabilities requiring unique methods for analytes that are not feasible in our large screen LC method, and that the MDA is currently not able to analyze for because of lack of adequate instrumentation.					\$2,000,000
		Thermo Autotrace Extractors	These four extractors will be used to increase sample capacity for the additional 500 samples targeted for our large screen LC-MS/MS analytes in this proposal.					\$132,815
							<b>Sub Total</b>	<b>\$2,132,815</b>



<b>Acquisitions and Stewardship</b>								
							<b>Sub Total</b>	-
<b>Travel In Minnesota</b>								
							<b>Sub Total</b>	-
<b>Travel Outside Minnesota</b>								
							<b>Sub Total</b>	-
<b>Printing and Publication</b>								
							<b>Sub Total</b>	-
<b>Other Expenses</b>								
		Indirects		Based on percentage set annually by Finance and Budget to take from all non-general funds to pay for expenses incurred (salary, supplies, computers) for the Finance and Budget division, Commissioners Office and HR division. Also used to pay for agency wide MN.IT costs that can't be assigned to a specific division.				\$113,106
							<b>Sub Total</b>	<b>\$113,106</b>
							<b>Grand Total</b>	<b>\$3,000,000</b>

## Classified Staff or Generally Ineligible Expenses

Category/Name	Subcategory or Type	Description	Justification Ineligible Expense or Classified Staff Request
<b>Personnel</b> - Quality Officer		This position is part of the Lab's Quality Assurance Unit and will be responsible for supporting activities related to the additional LCMSMS methods that will be added to the scope of the lab's ISO17025 accreditation. Duties will include performing internal audits of new methods for direct inject analysis, glufosinate and other methods that will require unique chemistry methods, providing assistance for quality control charts, measurement uncertainty calculations, and evaluation of PT (performance testing) samples.	<b>Classified</b> : The additional time required for performing internal audits will be absorbed with current positions and will cover the costs associated with adding the new methods to the scope of the MDA's Laboratory ISO17025 accreditation.
<b>Personnel</b> - Forensic Evidence Specialist		This position is part of the lab Operation Unit and will be responsible for supporting activities related to the additional LCMSMS samples. Duties include logging in samples, maintaining chain of custody, storage of samples, purchasing supplies, and instrument purchases / service contracts.	<b>Classified</b> : The additional samples being logged into the laboratory, and time required for purchasing and distributing new supplies will be absorbed with current Operation positions and will cover the costs associated with the extra time required for completing these tasks over the next 2 years.

Non ENRTF Funds

Category	Specific Source	Use	Status	Amount
State				
			State Sub Total	-
Non-State				
			Non State Sub Total	-
			Funds Total	-

## Attachments

### Required Attachments

#### *Visual Component*

File: [b29df542-3a4.pdf](#)

#### *Alternate Text for Visual Component*

The graphic highlights three issues that the MDA Laboratory is facing, including aging equipment, frequent breakdowns and older technology. The graphic has two maps, one which show the 2019 findings for total cyanazine in peoples drinking water and the other the findings of neonicotinoids pesticides in surface water in 2019. The middle graphic shows the current LC-MS/MS equipment. The text box in the middle of the graphic indicates one for the key findings from 2020 Office of the Legislative Auditor: "Limitations to MDA's laboratory methods prevent it from analyzing certain pesticides, including three commonly sold pesticide active ingredients or breakdown products that are both high risk and toxic to humans or aquatic life (pg. 84)."

### Administrative Use

**Does your project include restoration or acquisition of land rights?**

No

**Does your project have patent, royalties, or revenue potential?**

No

**Does your project include research?**

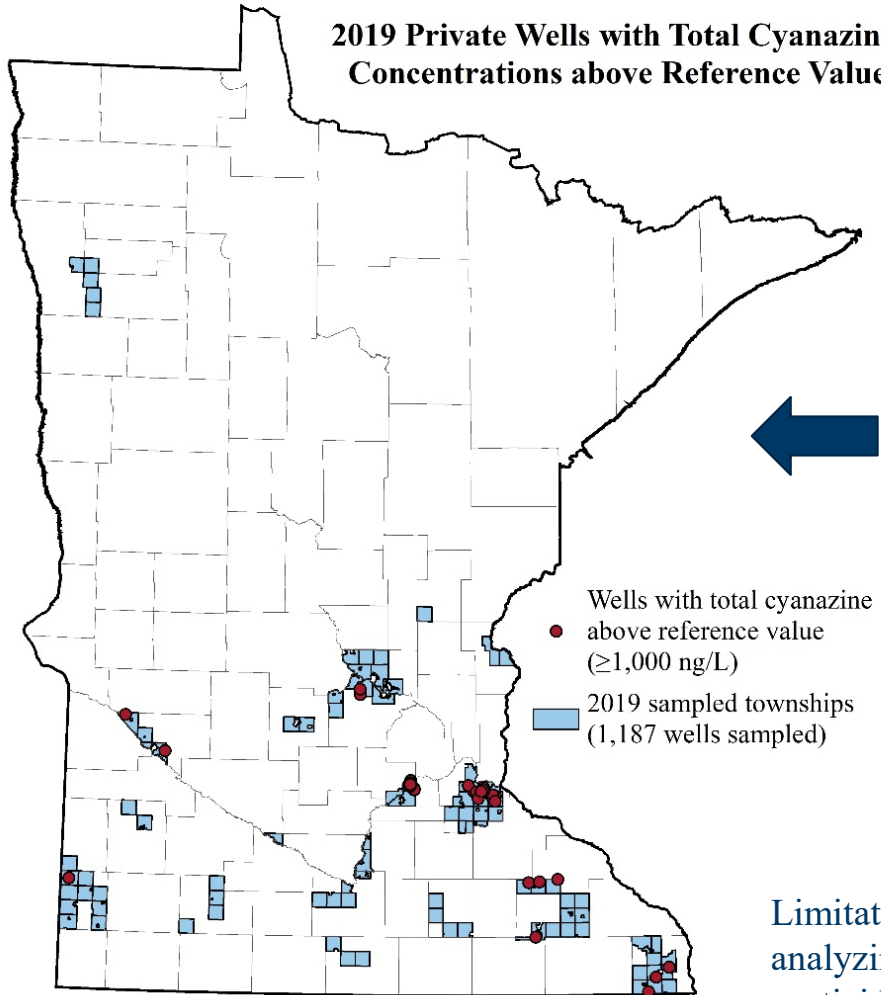
No

**Does the organization have a fiscal agent for this project?**

No

# Updating Pesticide Analytical Capabilities to Protect Minnesota Waters

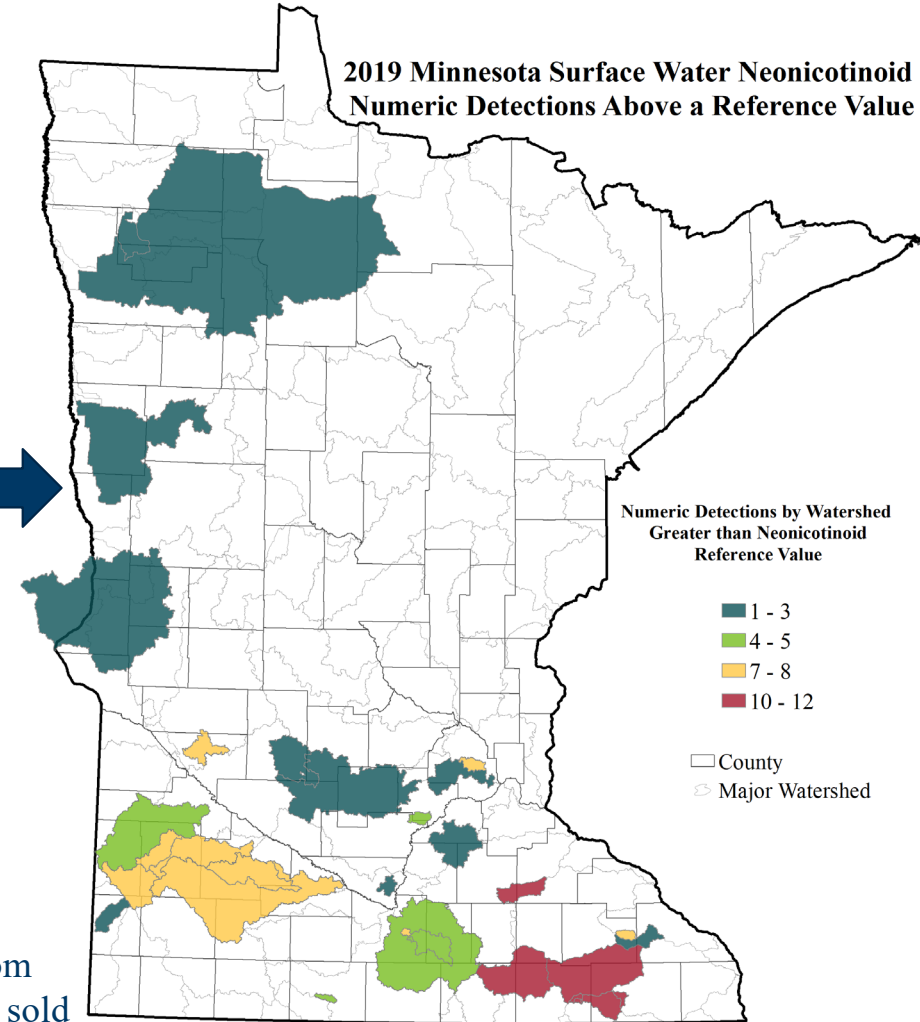
2019 Private Wells with Total Cyanazine Concentrations above Reference Value



- Aging equipment
- Frequent breakdowns
- Older technology



2019 Minnesota Surface Water Neonicotinoid Numeric Detections Above a Reference Value



## Key Finding from 2020 Office of the Legislative Auditor:

Limitations to MDA's laboratory methods prevent it from analyzing certain pesticides, including three commonly sold pesticide active ingredients or breakdown products that are both high risk and toxic to humans or aquatic life (pg. 84)

