

**Environment and Natural Resources Trust Fund**

# 2022 Request for Proposal

## **General Information**

**Proposal ID:** 2022-251

**Proposal Title:** Mitigations Strategies for Agroplastic PFAS and Microplastic Contamination

## **Project Manager Information**

**Name:** Joel Tallaksen

**Organization:** U of MN - WCROC

**Office Telephone:** (320) 589-1711

**Email:** tall0007@umn.edu

## **Project Basic Information**

**Project Summary:** This project examines strategies to reduce water and land contamination from microplastics, PFASs, and other contaminants due to plastics use in agriculture (agroplastics) and their limited recycling options

**Funds Requested:** $169,000

**Proposed Project Completion:** June 30 2024

**LCCMR Funding Category:** Small Projects (H) **Secondary 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.**

Plastics use in the agricultural supply chain (agroplastics) has been increasing significantly. As a result, the risks of these plastics and their components, such as poly-fluoroalkyl substances (PFAS) and microplastics, ending up contaminating water and soils has grown dramatically. This project’s objectives are to identify the scope and scale of agroplastics use, model potential environmental impacts, examine opportunities for mitigating problems, and finally, develop information for farmers, policy makers, and recyclers to establish a system for reducing impacts.
The environmental impacts of microplastics, PFAS, and other agroplastic related compounds are now better understood. PFAS are a particular concern as they are water soluble, long-lasting, and bioaccumulate; meaning that crops will accumulate PFAS from groundwater, and then livestock or people eating the plants will further concentrate the PFAS in their bodies. Microplastics particles from the breakdown of agroplastics have been shown to impact plant growth, and can be moved from soil to water during erosion.
Agroplastics are indispensable in modern agriculture; often being used for containers, in greenhouse construction, plastic mulches, and forage covering. Developing strategies to mitigate the long-term environmental impacts from these agroplastics is important, but very little organized data currently exists on agroplastics or potential environmental impacts.

**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 quantifies Minnesota’s agroplastic use and potential impacts in order to foster the informed discussions between farmers, commercial recyclers, and policy makers needed to develop mitigation strategies to reduce agroplastic impacts. Recycling this material has been difficult because of contamination with dirt or livestock feed, manufacturing chemicals like PFAS, remnant fertilizers, or pesticides.

First, we will work with farmers and farm suppliers to understand the types and volumes of agroplastics in use, where they are being used, and how they are being disposed of.

The next phase of work examines how the contaminants and microplastic particles impact the environment. Already, a handful of farms nationwide have had milk contaminated by non-agricultural PFAS from PFAS contaminated well water. However, are the current quantities in Minnesota’s water and soil sufficient to cause health or other problems? Which problems? And what is the result of not attempting mitigation?

A final area of investigation is the current, past, and potential recycling efforts to reduce the likelihood of contaminants entering the environment; and, the factors influencing the success or failure of these efforts. Recently, agroplastic recycling systems have experienced economic challenges related to international plastic prices and their large, dispersed collection territories.

**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?**

The main outcome from this project is an informational ‘toolbox’ that covers the use of and impacts from agroplastic contaminants entering our water and soil systems, and potential mitigations strategies. It will establish a baseline of information so that key participants in the agroplastic issue can develop policies and systems to protect Minnesota’s waterways and other natural resources from contamination by the components of agroplastics. Additionally, we intend that this information be more widely disseminated in the agricultural community so that farmers understand why there are growing concerns about the plastics they have been using for decades.

## **Activities and Milestones**

### **Activity 1: Identifying the Use of Agricultural Plastics**

**Activity Budget:** $65,000

**Activity Description:**Estimating total agroplastic use and the types of plastic will be conducted using a number of data sources to overcome the lack of specific data collection on agroplastics. In person/phone call Interviews with willing farm stakeholders will examine their opinions and suggestions on plastics in agriculture. This initial feedback will aid in the development of an online farmer survey. The farmer survey will focus on the plastic use of different farm types and sizes. Disposal methods for plastics will also be a part of the survey. A similar survey will target agricultural chemical and supply vendors. To scale this data up to represent the full volume of agroplastic use in the state, existing data from the USDA-NASS and USDA-ARMS databases on the number and types of farms in each region of the state be combined with data from the farm surveys.

The findings from the survey work will help identify particular problem areas in current recycling efforts. Overcoming these barriers would provide important opportunities for reducing the contaminants from agroplastics that are entering the environment. These opportunities will then be further explored in Activity 3.

**Activity Milestones:**

|  |  |
| --- | --- |
| **Description** | **Completion Date** |
| Initial Interviews with Farm Stakeholders | March 31 2023 |
| Finish Survey and Data Collection | June 30 2023 |
| Final Report on Agroplastic Use | June 30 2024 |

### **Activity 2: Investigate Potential Agroplastic Environmental Impacts**

**Activity Budget:** $65,000

**Activity Description:**Potential environmental impacts will be modeled using the farm survey agroplastic type and quantity data from Activity 1. The persistence and movement of agroplastic contaminants in the water and soil will be modeled. The modeling will also rely on existing scientific literature on plastics. Several scenarios will be modeled by looking at the different farm systems (plastic types) and disposal methods identified in Activity 1. Mitigation measures will be modeled based on best management practices of recycling or incineration at regulated facilities.

A further component of the environmental impacts will include data on current contamination of agricultural areas with PFAS and microplastics from the application of biosolid fertilizers and irrigation water from urban and rural wastewater treatment plants. Improper incineration, a potential concentrating source of PFAS for airborne contamination, will also be studied for impacts on agricultural areas. Another emerging issue that will be examined is the potential impact of PFAS that have been reported to be leeching from landfills throughout the state, many of which are in rural areas.

**Activity Milestones:**

|  |  |
| --- | --- |
| **Description** | **Completion Date** |
| Collect MN-based Contamination Data and Review Technical Literature on Environmental Issues | March 31 2023 |
| Model Typical Minnesota Agroplastic Contamination Scenarios | December 31 2023 |
| Final Report on Potential Impacts of Agroplastics | June 30 2024 |

### **Activity 3: Explore Previous, Existing, and Potential Agroplastics Mitigation Strategies**

**Activity Budget:** $39,000

**Activity Description:**This activity examines existing and potential options for mitigating likely problems with agroplastic use including recycling, landfilling, and incineration. Interviews will be conducted with willing recycling services that are or have recycled agroplastics, retailers required to accept plastic container returns, and counties working to meet farmer needs. Questions will include, ‘what factors are/have limited agroplastic recycling?’, ‘what opportunities do they see for recycling a broader range of plastics?’, and ‘what would help stabilize the agroplastics recycling sector for long-term viability?’. We also will contact the leaders of agroplastic collection/mitigation efforts in other states to identify whether these efforts may work in Minnesota or can be modified to meet Minnesota’s needs. A major focus of these strategies will be to foster areas for cooperation involving farmers, those in the recycling/mitigation sector, and policy makers/citizens. Strategies will be evaluated based on economics, logistics, and environmental impacts. Outreach literature, videos, and web pages will be established to introduce the agroplastics issues to agricultural and non-agricultural audiences. Developed in a farmer-friendly tone, this outreach information will likely be needed to overcome reluctance of farmers and farm organizations to engage in discussion and actions to reduce potential agroplastic impacts.

**Activity Milestones:**

|  |  |
| --- | --- |
| **Description** | **Completion Date** |
| Investigate Current Agroplastic Mitigation Strategies and Barriers | December 31 2022 |
| Identify and Examine Alternative Agroplastic Potential Mitigation Strategies | September 30 2023 |
| Final Report on Agroplastic Mitigation Strategies, with Outreach Materials | June 30 2024 |

## **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?**The long-term goal of this work is development of an economically self-sustaining system that meets the convenience needs of participating farmers and the environmental needs of the citizens of Minnesota. The farmers, recycling businesses, and policy makers interested in keeping contaminants such as PFAS and microplastics out of our waterways and soils will be the ones whose efforts will be required to agree to and implement changes to mitigate agroplastic contamination. It is not expected that funds beyond those requested for this proposed data collection effort would be needed to provide data to these core audiences.

## **Project Manager and Organization Qualifications**

**Project Manager Name:** Joel Tallaksen

**Job Title:** Research Manager

**Provide description of the project manager’s qualifications to manage the proposed project.**Dr. Tallaksen’s current efforts examine a wide array of strategies for improving the resiliency of farming, with a primary focus on environmental and energy issues in agriculture. His goal is to reduce or optimize farm inputs, such as energy or fertilizer, in ways that create productive systems that use less resources and have less environmental impacts. These are core topics of agricultural resilience, which looks at the long-term viability of agriculture in the context of soil and environmental health, economic well-being, and human capital of our farming communities. Making improvements to farm systems often involves working in combination with farmers, policy makers, businesses, and the public to balance the competing interests and responsibilities. Working with a diverse team of animal and crop farmers, researchers, Extension staff, and students, Dr. Tallaksen is able to examine complex agriculture problems and disseminate the results to the diverse audiences he works with. Much of his research uses modeling techniques to evaluate the environmental, energy, and economic aspects of the system he studies. One of the important research tools he uses is life-cycle analysis (LCA), which examines the amount of energy needed and greenhouse gases emitted in a variety of livestock and cropping systems. But the diverse nature of his work relies on data and methods from a number of fields.

Recent Projects involving Dr. Tallaksen:
• Improving alfalfa-based livestock forage production systems using life cycle assessment.
• Breaking barriers to organic swine transition: Utilizing cover crops as feed ingredients to reduce feed cost.
• Evaluate different energy sources for renewable ammonia fertilizer production using life cycle methods.
• Integration of renewable and efficient energy technologies to green energy consumed in agricultural production system
• Environmental Footprints for Regional Swine Production Systems Now and in the Future – A Demonstration Pilot Project
• Optimizing Renewable Electric Generation on Minnesota Dairy Farms

**Organization:** U of MN - WCROC

**Organization Description:**The University of Minnesota is a world class educational and research institution with campuses and research centers throughout the state. The combination of exceptional faculty and staff knowledge with the latest in research facilities and equipment gives the University of Minnesota the ability to consistently conduct ground-breaking research.
The West Central Research and Outreach Center is one of the Universities’ living laboratory where agricultural research can be demonstrated at scale and it serves as a regional center for agricultural stakeholders to discuss current issues in agriculture with a variety of field experts. The decades of farm research that WCROC has conducted has built working relationships with farmers and stakeholders that allows us to work on their farms and get honest feedback from them.
Recently, the resiliency of Minnesota farms has been tested as farmers are asked to provide food, feed, and fuel for the nation at the same time they are being asked to do it at a low cost, with a small environmental footprint. WCROC and its research partners have been developing a number of tools and strategies to increase the economic and environmental resilience of the states’ farm communities to meet these challenges.

## **Budget Summary**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Category / Name** | **Subcategory or Type** | **Description** | **Purpose** | **Gen. Ineli gible** | **% Bene fits** | **# FTE** | **Class ified Staff?** | **$ Amount** |
| **Personnel** |  |  |  |  |  |  |  |  |
| Joel Tallaksen |  | Principle Investigator-This position is a soft-funded position and is reliant on external research dollars (i.e. the University of Minnesota does not support the position with recurring funds |  |  | 36.5% | 1.5 |  | $136,217 |
| Student Interns |  | Assist with data collection & outreach- 4 summer students @ 540 hours |  |  | 0% | 1 |  | $28,080 |
|  |  |  |  |  |  |  | **Sub Total** | **$164,297** |
| **Contracts and Services** |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  | **Sub Total** | **-** |
| **Equipment, Tools, and Supplies** |  |  |  |  |  |  |  |  |
|  | Tools and Supplies | Data collections supplies | Supplies for collection, storage, and organization of research data |  |  |  |  | $859 |
|  |  |  |  |  |  |  | **Sub Total** | **$859** |
| **Capital Expenditures** |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  | **Sub Total** | **-** |
| **Acquisitions and Stewardship** |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  | **Sub Total** | **-** |
| **Travel In Minnesota** |  |  |  |  |  |  |  |  |
|  | Miles/ Meals/ Lodging | 2 yrs x 4 trips per year X 300 miles X $0.56/mile | Travel to meet with stakeholders and professionals within state |  |  |  |  | $1,344 |
|  |  |  |  |  |  |  | **Sub Total** | **$1,344** |
| **Travel Outside Minnesota** |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  | **Sub Total** | **-** |
| **Printing and Publication** |  |  |  |  |  |  |  |  |
|  | Printing | Printing of project report and surveys | Printing of surveys, project outreach literature, and final report. |  |  |  |  | $2,500 |
|  |  |  |  |  |  |  | **Sub Total** | **$2,500** |
| **Other Expenses** |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  | **Sub Total** | **-** |
|  |  |  |  |  |  |  | **Grand Total** | **$169,000** |

### **Classified Staff or Generally Ineligible Expenses**

|  |  |  |  |
| --- | --- | --- | --- |
| **Category/Name** | **Subcategory or Type** | **Description** | **Justification Ineligible Expense or Classified Staff Request** |

### **Non ENRTF Funds**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Category** | **Specific Source** | **Use** | **Status** | **Amount** |
| **State** |  |  |  |  |
|  |  |  | **State Sub Total** | **-** |
| **Non-State** |  |  |  |  |
| In-Kind | University of Minnesota In-kind funds | In kind: The University of Minnesota is forgoing the typical 54.5% federally negotiated indirect cost recovery normally associated with research grants. This funding covers facilities, support staff, and other University activities that are not directly part of the research, but must be present to support research activities. | Pending | $92,045 |
|  |  |  | **Non State Sub Total** | **$92,045** |
|  |  |  | **Funds Total** | **$92,045** |

## **Attachments**

### **Required Attachments**

#### ***Visual Component***

File: [1e6dec28-5dc.pdf](https://lccmrprojectmgmt.leg.mn/media/map/1e6dec28-5dc.pdf)

#### ***Alternate Text for Visual Component***

The increasing use of plastics in agriculture. The images below show some of the most important uses of agroplastics in modern agriculture in Minnesota. The Largest use of agroplastics is for preserving forage for livestock by encasing it in air-tight plastic sheeting. Clear plastic sheeting is also used to cover traditional greenhouses and, high and low tunnels greenhouses. Plastic Mulch is used with many fruits and vegetables to prevent soil contact, suppress weeds and reduce evaporatio...

### **Optional Attachments**

#### ***Support Letter or Other***

|  |  |
| --- | --- |
| **Title** | **File** |
| University of Minnesota Approval Letter | [79edffb6-f7b.pdf](https://lccmrprojectmgmt.leg.mn/media/attachments/79edffb6-f7b.pdf) |

## **Administrative Use**

**Does your project include restoration or acquisition of land rights?**
 No

**Does your project have potential for royalties, copyrights, patents, or sale of products and assets?**
 No

**Do you understand and acknowledge IP and revenue-return and sharing requirements in 116P.10?**
 N/A

**Do you wish to request reinvestment of any revenues into your project instead of returning revenue to the ENRTF?**
 N/A

**Does your project include original, hypothesis-driven research?**
 No

**Does the organization have a fiscal agent for this project?**
 Yes, Sponsored Projects Administration