



Environment and Natural Resources Trust Fund

2024 Request for Proposal

General Information

Proposal ID: 2024-132

Proposal Title: Reducing Rural Air Pollution to Benefit All Minnesotans

Project Manager Information

Name: Jason Hill

Organization: U of MN - College of Food, Agricultural and Natural Resource Sciences

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Project Basic Information

Project Summary: Pollution from agriculture is a major cause of air-quality-related deaths in Minnesota. This project explores how better farming practices in our state can improve air quality and promote environmental justice.

Funds Requested: \$251,000

Proposed Project Completion: June 30, 2026

LCCMR Funding Category: Air Quality, Climate Change, and Renewable Energy (E)

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.

Poor air quality caused by agriculture is a major contributor to poor health and premature mortality. Recent research from my research group at the University of Minnesota has shown that in our state, approximately 700 deaths per year are attributable to agricultural activity in the state, and both rural and urban Minnesotans are affected. Most of these deaths are caused by emissions of ammonia from fertilizer and manure, but dust from tilled fields and particulate matter from farm equipment also contribute. Our work, building on that of others, has also identified many ways to reduce agriculture's impacts on air quality, including changes in the amount, timing, and type of fertilizer use and cultivation, mitigation measures in livestock-production facilities, and more efficient fuel use along agricultural supply chains. How and where these improvements might best be deployed to maximize reductions in the health effects of air pollution is unknown, however. There is no Minnesota-specific guide for how changes to farming practices and technologies might be best deployed or prioritized to improve our state's air quality. This information gap hinders efforts to address agriculture's impacts on air quality to the same degree as other sectors such as transportation, housing, and industry.

What is your proposed solution to the problem or opportunity discussed above? Introduce us to the work you are seeking funding to do. You will be asked to expand on this proposed solution in Activities & Milestones.

This proposal is to develop a guide for stakeholders such as policymakers, regulators, and farmers to inform them on their options to reduce Minnesota agriculture's negative impact on air quality. State-of-the-science computer models developed here at the University of Minnesota in partnership with other institutions allow for the rapid assessment of a broad range of emission sources and types. These models will allow us to gain a broad understanding of agricultural emission impacts in the state, and importantly, also describe its effects on environmental justice. Our work will explore how methods of reducing impacts in agriculture might affect levels of fine particulate matter (PM2.5) in the air, as it is the primary pollutant leading to poor health outcomes, including premature mortality. We will then consider how these change in PM2.5 levels affect health, both in aggregate and with respect to environmental justice concerns. We will then monetize these changes so as to provide a basis for comparing the economic value of health benefits against the economic costs of implementation. Put more plainly, our work will show what options for cleaning agricultural air pollution result in the greatest benefits at the lowest costs.

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 specific outcome of this project is increased public understanding of how to reduce the negative air quality impacts of Minnesota agriculture, which recent work has indicated leads to 700 deaths per year. This project will provide actionable information for farmers, agribusiness, investors, environmental non-governmental organizations, policymakers, regulators, and consumers to reduce these deaths. Our work will both raise awareness of the problem and provide a roadmap for solutions that might be implemented to realize benefits to all Minnesotans, while also providing information on environmental justice considerations to achieve mutually positive outcomes across rural and urban populations.

Activities and Milestones

Activity 1: Quantify the changes in emissions of air-quality-related pollution from improved farming practices

Activity Budget: \$125,500

Activity Description:

The objective of this activity is to quantify the changes in emissions of air-quality-related pollutants arising from improvements in agricultural practices. The tasks involved include preparing a thorough list of potential improvements and their estimated changes in emissions, and developing a range of scenarios in which these improvements are deployed in the Minnesota agricultural landscape using GIS software. Data will be sourced from publicly-available state and federal resources, communications with producers, and communications with experts. Air pollutants to be considered are those that affect levels of fine particulate matter (PM2.5). They include primary PM2.5 and secondary PM2.5 precursors such as ammonia, nitrogen oxides, sulfur oxides, and volatile organic compounds. The specific outcome will be a spatially-explicit inventory of pollutants emitted under different mitigation scenarios, and this inventory will be described in a midpoint report. The outcomes will be evaluated through peer review.

Activity Milestones:

Description	Approximate Completion Date
Inventory and scenarios developed	June 30, 2025
Midpoint Report	June 30, 2025

Activity 2: Quantify the human health and environmental justice benefits from improved farming practices

Activity Budget: \$125,500

Activity Description:

The objective of this activity is to quantify the changes in human health and environmental justice outcomes arising from the modeled improvements in agricultural practices. The tasks involved include using the emissions inventories developed in Activity 1 as inputs to a computer model that estimates changes in health outcomes and environmental justice metrics. The specific outcome will be estimated changes in health outcomes under the different mitigation scenarios, and these results will be described in a final report that also includes the results of the midpoint report. The outcomes will be evaluated through peer review.

Activity Milestones:

Description	Approximate Completion Date
Inventory and Scenarios Assessed	June 30, 2026
Final Report	June 30, 2026

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 work be funded?

The results will be published in a report and in the peer-reviewed scientific literature. This report and its underlying data will be open access and distributed widely to Minnesota stakeholders. Public presentations on the findings of the report will also be held. No additional work will be needed, but opportunities to leverage this project to secure additional funding from federal sources (e.g., USDA and US-EPA) to expand upon it will be explored.

Project Manager and Organization Qualifications

Project Manager Name: Jason Hill

Job Title: Professor

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

Jason Hill is Professor in the Department of Bioproducts and Biosystems Engineering at the University of Minnesota. He also serves as a Resident Fellow of the University's Institute on the Environment. His research focuses on the consequences of food, energy, agriculture, and natural resources from a life-cycle perspective. Dr. Hill has testified before U.S. House and Senate Committees on the environmental effects of biofuels. His work has been published in the journals *Science* and the *Proceedings of the National Academy of Sciences*. He served on the National Research Council's (NRC) Committee on the Economic and Environmental Impacts of Increasing Biofuels Production, the National Academies of Sciences, Engineering, and Medicine (NAEM) Committee on Current Methods for Life Cycle Analyses of Low-Carbon Transportation Fuels in the United States, and on the US-EPA's Science Advisory Board's Biogenic Carbon Advisory Panel. He is a co-author of the Mitigation Chapter of the Fifth National Climate Assessment (NCA5). He has managed numerous sustainability related projects from funding sources that include the US-EPA, U.S. Dept. of Energy, USDA, U.S. Dept. of State, and USAID. Dr. Hill received his AB in Biology from Harvard College and his PhD in Plant Biological Sciences from the University of Minnesota.

Organization: U of MN - College of Food, Agricultural and Natural Resource Sciences

Organization Description:

In the College of Food, Agricultural and Natural Resources Sciences (CFANS) at the University of Minnesota, we look at the bigger picture. When we envision a better tomorrow, it includes disease-resistant crops, products that protect our health, lakes free from invasive species, and so much more. We use science to find answers to Minnesota and the world's grand challenges and solve tomorrow's problems. Almost 93 percent of students who earn CFANS undergraduate degrees find jobs in their career field or enter graduate school within six months of graduation.

The Department of Bioproducts and Biosystems Engineering, in CFANS, discovers and teaches solutions for the sustainable use of renewable resources and the enhancement of the environment. We discover innovative solutions to address challenges in the sustainable production and consumption of food, feed, fiber, materials, and chemicals by integrating engineering, science, technology, and management into all degree programs.

We have a public impact through community engagement and extension efforts. We develop and deliver high quality, regionally and nationally-recognized research-based programs to meet current and emerging needs of industry and communities. We also have a long-standing tradition of close partnerships with alumni, industry professionals, organizations, government agencies, donors, and community members.

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	\$ Amount
Personnel								
Professor Jason Hill/Project Lead		Direct, oversee, and manage all aspects of project			36.8%	0.16		\$37,182
Graduate Student Researchers (2 positions)		Conduct research and analysis under the direction of the Lead, education			86%	4		\$213,675
							Sub Total	\$250,857
Contracts and Services								
							Sub Total	-
Equipment, Tools, and Supplies								
	Tools and Supplies	external hard drives	expand computing/storage capacity					\$143
							Sub Total	\$143
Capital Expenditures								
							Sub Total	-
Acquisitions and Stewardship								
							Sub Total	-
Travel In Minnesota								
							Sub Total	-

Travel Outside Minnesota								
							Sub Total	-
Printing and Publication								
							Sub Total	-
Other Expenses								
							Sub Total	-
							Grand Total	\$251,000

Classified Staff or Generally Ineligible Expenses

Category/Name	Subcategory or Type	Description	Justification Ineligible Expense or Classified Staff Request
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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: [3f76e141-9fe.pdf](#)

Alternate Text for Visual Component

An example map of air quality-related health impacts, a graph of mitigation options, and a graphic of the air quality model to be used in this study...

Optional Attachments

Support Letter, Photos, Media, Other

Title	File
2022 Audit	48a5b264-e8b.pdf
Authorization	6f6786ca-a52.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?

Yes

Does the organization have a fiscal agent for this project?

No

Does your project include the design, construction, or renovation of a building, trail, campground, or other capital asset costing \$10,000 or more?

No

Do you propose using an appropriation from the Environment and Natural Resources Trust Fund to conduct a project that provides children's services, as defined in Minnesota Statutes section 299C.61 Subd.7?

No

