



# Environment and Natural Resources Trust Fund

2022 Request for Proposal

## General Information

**Proposal ID:** 2022-177

**Proposal Title:** Pathways to reduced emissions while improving land use

## Project Manager Information

**Name:** James Gerber

**Organization:** U of MN - Institute on the Environment

**Office Telephone:** (612) 625-7591

**Email:** jsgerber@umn.edu

## Project Basic Information

**Project Summary:** Develop pathways and assessment tools with stakeholder input to help MN reach zero greenhouse gas emissions goals in agriculture and land use.

**Funds Requested:** \$597,000

**Proposed Project Completion:** June 30 2025

**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.**

The state of Minnesota is committed to reducing greenhouse gases (GHGs) by 80% between 2005 and 2050. This requires mitigation in the land use sector, responsible for 24% of Minnesota's 2018 GHG emissions (source: MNPCA). Here, we aim to use a robust analysis to determine the most promising pathways available that can both be broadly supported by involved stakeholders and provide these deep emissions reductions in the agriculture, forest, and other land use sectors in Minnesota.

In contrast to electric and transportation sectors, where pathways for GHG reductions are well-described and there are concrete steps for action, most options for reducing GHGs in the land use sector remain poorly understood. Not only are there many "wedges" (mitigation strategies), they can have complex interactions with surrounding communities and natural ecosystems. Current analysis tools are not adequate for policy-relevant analysis since they don't integrate a broad set of interventions with co-benefits or with county-level specificity.

Further, engagement with stakeholders will be critical for understanding which "wedges" are most likely to gain community support, and to raise awareness of the benefits of changes to land use policies.

### **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.**

We propose a set of activities that would uncover the effective pathways for Minnesota's Agriculture, Forestry and Land Use (AFOLU) sectors to contribute to achieving net zero GHG emissions while preserving livelihoods and the natural environment.

Specifically, we will develop a set of pathways, covering multiple viable options including sustainable agriculture, biofuels, and natural ecosystem restoration.

Next, we will improve tools that analyze GHG emissions and broader impacts under differing agricultural and land use practices. Improvements are needed to model more land use policy options, to give detailed data on co-benefits and tradeoffs (e.g. water quality improvements from habitat restoration), and to provide county-level specificity.

Third, we will assess this set of pathways, quantifying GHG emissions and changes in ecosystem services.

Stakeholder engagement (farmers, private sector, government, NGOs, local communities and researchers) will inform this project. We propose to leverage ongoing agricultural adaptation workshops and partnerships, adding additional workshops run in each Regional Sustainable Development Partnerships (RSDP) region. These workshops will create the portfolio of pathways we analyze. Analysis outcomes will be shared again to solicit feedback and build community awareness.

This ongoing stakeholder feedback ensures policies proposed as final outcomes will work for the people of Minnesota.

### **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?**

Identification of areas where climate-targeted actions support critical benefits provided by natural areas, such as water quality, natural habitat, and recreation.

Assessment of pathways by which Minnesota can achieve deep mitigation in the Agriculture, Forestry, other Land Use (AFOLU) sector with policy-relevant information of costs and co-benefits.

APAT model (AFOLU Policy Analysis Tool) will be made freely available to land use planners.



## Activities and Milestones

### Activity 1: Engagement: Co-Creation of Scenarios and Pathways, Stakeholder Engagement, Sharing Analysis Results

**Activity Budget:** \$138,318

**Activity Description:**

We will determine a set of pathways covering a range of viable options including sustainable agriculture, biofuels, and natural ecosystem restoration for the Agriculture, Forestry and Other Land Use (AFOLU) sector using input from stakeholders including farmers, the private sector, government, local communities, NGOs and academia. First, we will collect information on pathways for Minnesota to achieve net-zero GHG goals. These pathways will include changes in how land and livestock are managed, (e.g. improved management of crop land and forests, transitions to next generation biofuels, expansion of renewable energy production, incentives for ecosystem restoration and incentives for sustainable livestock management.) We will also collect input information on landowners' livelihoods, their willingness to adopt the new practices that are crucial in these transitions, reducing GHG emissions and ecosystem services such as soil health, water quality, habitat and recreation access, and air quality. Finally, we will collect stakeholder input on policy-relevant "pain points" (e.g., job shifts, displacement) that could hinder the transitions. Stakeholder engagement is especially important in the complex AFOLU sector to ensure the perspectives of the stakeholders identified above are represented.

The results of our analysis will be presented in a final set of stakeholder meetings.

**Activity Milestones:**

Description	Completion Date
Completion of workshop planning	December 31 2022
Complete stakeholder input meetings in all RSDP regions	March 31 2023
Complete meetings presenting results in each RSDP stakeholder regions	March 31 2025

### Activity 2: Build "APAT" model, extending existing toolkit to include additional land uses, county-level parameters, ecosystem service co-benefits, and estimates of uncertainty.

**Activity Budget:** \$248,084

**Activity Description:**

We will improve on an existing crop agriculture climate solutions model in several important ways, building the "APAT" model (Ag-Forestry-Other-Land-Use Pathways Analysis Tool). The scope of the model will increase to be inclusive of livestock, forests and other natural lands (e.g. wetlands). To improve regional parameterization, we will incorporate COMET-PLANNER data, which provides county-specific parameters for modeling many land use practices. We will modify our tool to be interoperable with the existing INVEST ecosystem services model, developed at UMN and Stanford University to quantify multiple policy-relevant ecosystem services such as water quality protection and pollination. Finally, we will assess uncertainty in the projected carbon emissions (along each pathway), based on a literature search to determine a range of parameters for all modeled land use options.

This task will leverage a planned collaboration with the regional chapter of TNC to share their data on GHG emissions and other benefits of ecosystem restoration.

This new modeling capacity will directly improve our ability to inform Minnesota agencies and lawmakers about the best land management options for reducing relevant greenhouse gas emissions to that sector.

### Activity Milestones:

Description	Completion Date
Demonstration of functionality of APAT model, interoperability with INVEST model	March 31 2024
Technical report describing land use practices, GHG mitigation, co-benefits, and uncertainty in model.	July 31 2024
Publically accessible technical report, user guide, and code repository for APAT model.	October 31 2024

### Activity 3: Assess Costs and Benefits of Landscape Pathways

**Activity Budget:** \$210,598

#### Activity Description:

Description (200 words): We will use the set of carbon/GHG and ecosystem services models and analysis tools developed in Activity 2 to assess expected costs and benefits of the AFOLU pathways produced in Activity 1. For each of these pathways, there are multiple ways the constituent practices (climate wedges) could be distributed across the state, differing in costs and public co-benefits produced. We will analyze multiple scenarios, informed by stakeholder engagement, for each pathway and thus illustrate the range of potential opportunities presented.

We will measure costs in terms of changes to private income to landowners and farmers to highlight where public incentives will be needed to meet management strategy goals, and estimate nature-based co-benefits, e.g. water quality, soil health, and biodiversity conservation resulting from management changes or restoration. In this work, we will leverage enterprise budget development and ecosystem service modeling work for a USDA project underway at IonE.

We will summarize these results to illustrate expected costs, and co-benefits. These costs and co-benefits will be broken down regionally, and among different sets of stakeholders (e.g. landowners.) We will then report these results back to the stakeholder groups and write a summary report for policy-makers.

#### Activity Milestones:

Description	Completion Date
Develop pathway implementation scenarios	June 30 2023
Score the scenarios for costs and benefits	July 31 2024
Summarize pathway model results	September 30 2024
Develop reporting documents	January 31 2025

## 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?**

APAT modelling tool will be made available and shared with MPCA and MN Dept of Ag

Final results will be shared with legislators, stakeholders, MPCA and MN Dept of Ag

The Institute on the Environment will seek to bring this work to new partners, since it aligns strongly with commitments of the UMN system-wide strategic plan (Specifically, the following “MNtersections” goals )

\* “Build a fully sustainable future”

\* “Advance natural resources and agro-food systems to elevate human security and potential”

## Project Manager and Organization Qualifications

**Project Manager Name:** James Gerber

**Job Title:** Research Manager

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

Technical qualifications: Dr. Gerber has over ten years experience working in the area of land use and environmental impacts and is currently a lead author for the Intergovernmental Panel on Climate Change. He developed a calculation tool for estimating GHG impacts of some management practice interventions.

Program manager qualifications: Dr. Gerber has experience as sole PI of grants in excess of \$500,000 with multiple objectives and interdisciplinary teams.

**Organization:** U of MN - Institute on the Environment

**Organization Description:**

The Institute on the Environment (IonE) seeks to lead the way toward a future in which people and the environment prosper together. IonE is accelerating the transition to this future by supporting breakthrough research across disciplines, developing the next generation of global leaders and building transformative partnerships across the state, region and globe. IonE prides itself on not being academia as usual. At IonE, we go out of our way to collaborate with external partners while bringing different academic fields of expertise together within the University — all with an eye towards being responsive, agile and entrepreneurial in the face of a changing world. For more information about IonE, see <http://www.environment.umn.edu>,

## Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	\$ Amount
<b>Personnel</b>								
James Gerber, Project Investigator		Oversee entire project, Program lead Activity 2			36.5%	0.78		\$139,436
Peter Hawthron, Co-Investigator		Program lead Activity 3			36.5%	0.69		\$87,045
Heidi Ries, Co-Investigator		Program lead Activity 1			36.5%	0.78		\$72,587
Eric Lonsdorf, Co-Investigator		Specialist in analysis of natural capital and ecosystem services			36.5%	0.21		\$35,788
Jessica Gutknecht, Co-Investigator		Specialist in sustainable agriculture, soil carbon			36.5%	0.16		\$30,048
Data Scientist		Assist with integration of simulation modules, running model			36.5%	1.34		\$123,584
Copy Editor		Assist with production of Final Report			36.5%	0.08		\$8,448
Sean Quinn, Designer		Assist with design of Final Report			31.8%	0.39		\$2,715
Kimberly Long, Communications and Events coordinator		Assist with stakeholder engagement			31.8%	0.34		\$27,445
Graduate Research Assistant		Assist Sustainable Agriculture Specialist with Literature Search			19.9%	0.5		\$27,844
							<b>Sub Total</b>	<b>\$554,940</b>
<b>Contracts and Services</b>								
TBD	Professional or Technical Service Contract	A facilitator will provide crucial project planning and management, workshop design, facilitation and process documentation services for 10 planned workshops. They will be integral to engaging stakeholders on activities, practices and policies regarding Agriculture, Forestry and Other Land Use (AFOLU) sector climate solutions and				10.58		\$27,500

		conducting the workshops efficiently and productively.						
							<b>Sub Total</b>	<b>\$27,500</b>
<b>Equipment, Tools, and Supplies</b>								
	Tools and Supplies	Poster-size pads, pens, markers	Enable brainstorming, sharing, recording of ideas					\$750
							<b>Sub Total</b>	<b>\$750</b>
<b>Capital Expenditures</b>								
							<b>Sub Total</b>	-
<b>Acquisitions and Stewardship</b>								
							<b>Sub Total</b>	-
<b>Travel In Minnesota</b>								
	Miles/ Meals/ Lodging	In state trips for 4 people to the RSDP regions which are Central (St. Cloud 130 mi RT), NE (Duluth 310 mi RT), NW (Crookston 600 mi RT), SE (Rochester 170 mi RT) and SW (Morris 310 mi RT) in both year 1 and year 3. Mileage rate is \$0.56 per mile.	Multiple trips of twin-cities based personnel to attend stakeholder meetings in person.					\$6,810
							<b>Sub Total</b>	<b>\$6,810</b>
<b>Travel Outside Minnesota</b>								
							<b>Sub Total</b>	-
<b>Printing and Publication</b>								
	Printing	400 High-quality brochures with final report	Provide as a resource to legislators and interested parties. Distribute to stakeholders in “share back” sessions					\$1,000
							<b>Sub Total</b>	<b>\$1,000</b>
<b>Other Expenses</b>								



		Space Rental	Renting spaces for workshops					\$5,000
		\$25/hr/person for typical attendees, \$250 for keynote speaker	Incentivize stakeholders to honor commitments to attend workshops, demonstrate that their time and inputs are valued.					\$1,000
							<b>Sub Total</b>	<b>\$6,000</b>
							<b>Grand Total</b>	<b>\$597,000</b>

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
<b>State</b>				
In-Kind	The O&M funding that is allocated by the UofM OVPR which is funded by the state	In-kind contributions will be offered to cover 1% of Dr. Melissa Kenney for supporting working across interdisciplinary research team along with unrecovered F&A for the project.	Secured	\$6,713
			<b>State Sub Total</b>	<b>\$6,713</b>
<b>Non-State</b>				
			<b>Non State Sub Total</b>	-
			<b>Funds Total</b>	<b>\$6,713</b>

## Attachments

### Required Attachments

#### *Visual Component*

File: [5e52d15e-de7.pdf](#)

#### *Alternate Text for Visual Component*

This is a graphical representation of the three activities, the main objectives in each, and some indications of how tasks relate to each other....

## 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

# Pathways to reduced emissions while improving land use

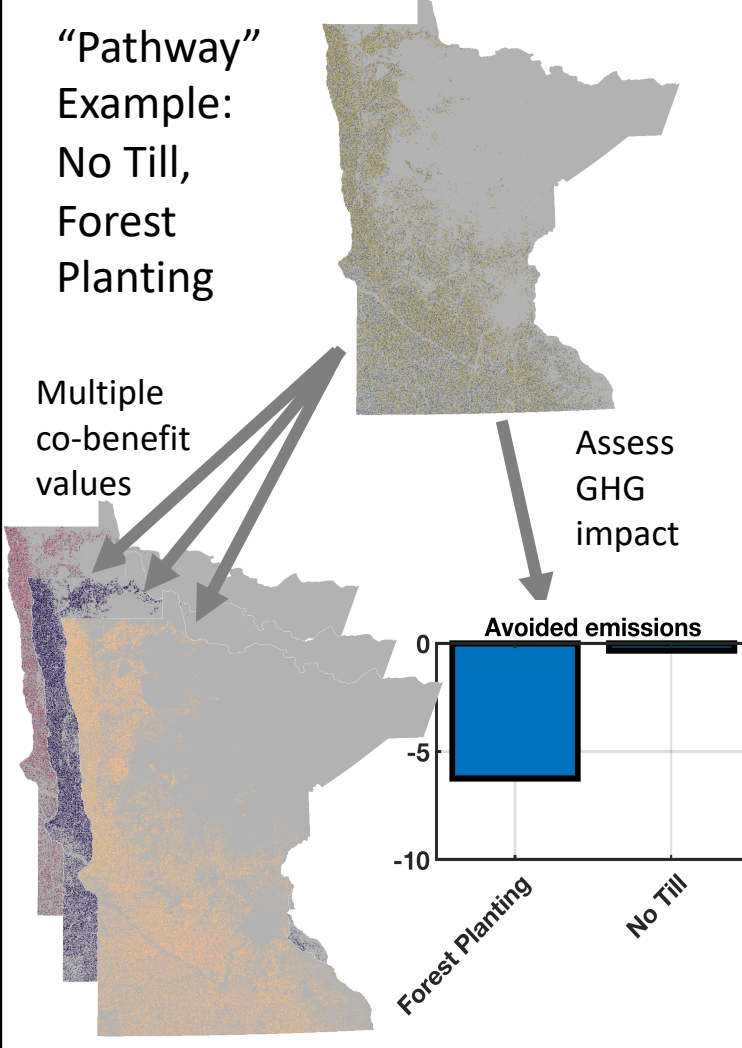
## Activity 1: Engagement

- With Multiple Stakeholders ...*
- Farmers
  - Government
  - Agribusiness
  - Tribes
  - NGOs
  - RSDPs
  - Extension
  - Other UMN



- ... Identify Pathways*  
e.g. Habitat restoration, cover crops, manure management
- ... ID co-benefits and concerns*  
e.g. improved pollinator habitat, costs to farmers
- ... share assessment results*

## Activity 2: Model development



## Activity 3: Evaluate and compare alternative pathways

