



## Environment and Natural Resources Trust Fund

### 2026 Request for Proposal

#### General Information

**Proposal ID:** 2026-307

**Proposal Title:** Managing Minnesota's Forests for Carbon: Tradeoffs and Synergies

#### Project Manager Information

**Name:** Irene De Pellegrin Llorente

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

**Office Telephone:** (612) 624-4280

**Email:** depel001@umn.edu

#### Project Basic Information

**Project Summary:** Forests mitigate climate change by removing carbon from the atmosphere. Managing forests for carbon credits might impact other forest management objectives. Identifying tradeoffs and synergies across objectives is key.

**ENRTF Funds Requested:** \$328,000

**Proposed Project Completion:** June 30, 2029

**LCCMR Funding Category:** Land (F)

#### 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.**

Forests contribute to mitigating climate change by removing carbon from the atmosphere and storing it in woody biomass and harvested wood products. In recent years, programs have been developed to incentivize landowners to enhance carbon storage. Specific forest management practices, such as reducing harvest volumes or extending the time between harvests, are central to improved forest management (IFM) carbon projects, which aim to sequester more carbon than business-as-usual baseline management. Implementing IFM projects may generate carbon offsets, which can be sold to offset carbon emissions. Sometimes, these programs require the landowner to commit to the predefined IFM strategies for several decades.

Forest landowners often manage their land to achieve a myriad of objectives, such as biodiversity, carbon storage, water quality, or recreation. These objectives might require desired balanced age classes that promote a sustainable supply of all values. However, implementing IFM projects for 100 years may conflict with other desired forest management goals, such as wildlife, forest health, or timber production.

Moreover, as carbon offset markets emerge, many landowners may be drawn to short-term financial benefits without fully considering the long-term impacts of carbon projects on their land. Our project will identify potential long-term tradeoffs across forest management objectives.

**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.**

Identifying interactions and synergies between forest management objectives, such as managing to sequester and store forest carbon, managing for timber production, or managing for wildlife objectives, is key for Minnesota's forests. In collaboration with a panel of carbon offset experts, we will develop realistic baseline scenarios that reflect typical Minnesota forest management practices across various ownerships. Realistic baseline scenarios are crucial to ensure accurate estimates of additional carbon sequestration and storage related to IFM projects. We will use these scenarios to evaluate the long-term IFM impacts on other forest management goals over time, such as timber production or wildlife habitat. Assessing the tradeoffs and synergies between forest management objectives would inform about the efficiency of applying IFM strategies to Minnesota's forests. The last step includes developing an additional project to redefine the forest carbon credits market to better support climate adaptation and resiliency of Minnesota's forest through current and developing forest product markets.

This will provide opportunities to ensure that forest management in Minnesota continues to produce critical forest goods and services while also creating more sustainable and resilient forests.

**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 findings from this project will offer valuable insights into forest management that are of interest to natural resource management agencies, non-industrial private landowners, and forest industry partners in Minnesota. Specifically, it will document the short- and long-term compatibility and tradeoffs that are associated with different forest management strategies in Minnesota's forests. This project also creates new opportunities for collaborations between CFANS and UMN Extension, as well as further engagement with major forest stakeholders in the state forestry community, benefiting the sustainability and enhancement of our natural resources and, therefore, all citizens across the state.

## Activities and Milestones

### Activity 1: Develop realistic baseline scenarios that reflect typical Minnesota forest management actions across different ownerships

**Activity Budget:** \$95,286

#### Activity Description:

Long-term forest planning models often require large amounts of information. We will use USDA Forest Inventory and Analysis data from the Forest Service for Minnesota and simulate the on-the-ground management strategies using the Forest Vegetation Simulator (FVS). The FVS model is an individual tree model that uses lists of trees (e.g., species and tree diameter) to forecast forest growth through time. We will use the growth and yield projections developed in a recent study funded by the Minnesota Forest Resource Council (MFRC) (Estimating current and future carbon stocks and emissions in Minnesota forests and forest products under multiple management scenarios) to predict how the forest will grow under different management strategies. This objective will be accomplished in consultation and collaboration with various Minnesota forest stakeholders and landowners to ensure the baseline scenario reflects actions commonly taken by the state's forest landowners. Collaborative groups include but are not limited to the MN DNR Division of Forestry and the land commissioners of Carlton and Koochiching counties, with additional information from members of the MFRC, specifically David Wilson (MFRC's Applied Forest Science Coordinator), the Minnesota Forest Resources Partnership, and the Minnesota Forest Industry. We will also include private landowners' perspective.

#### Activity Milestones:

Description	Approximate Completion Date
Preparation of the forest inventory and integration into the model	December 31, 2026
Growth and yield review and integration into the model	June 30, 2027
Define state and county forest management goals, objectives, and strategies	June 30, 2027
Define private landowners forest management goals, objectives, and strategies	June 30, 2027

### Activity 2: Evaluate long-term IFM impacts over time

**Activity Budget:** \$106,036

#### Activity Description:

Using a carbon offset expert panel and the standards protocols from the American Carbon Registry, we will define a range of forest management scenarios using different IFM strategies. Simulating these scenarios over time (100 years) would allow us to understand the forest carbon offset potential. We will define different levels of how much forest would be allocated to forest carbon offsets by assessing the willingness of our collaborators and stakeholders to participate in IFM carbon projects.

We will use the Forest Carbon Management solution recently implemented in Woodstock Optimization Studio to simulate these scenarios and assess the potential of Minnesota's forests to produce other forest management objectives and store additional carbon.

Results from this objective will provide key information on carbon credits produced and economic incentives received under different scenarios.

#### Activity Milestones:

Description	Approximate Completion Date
Integrating of Activity 1 (baseline scenarios) into Woodstock Optimization Studio	December 31, 2027
Defining forest management scenarios using IFM strategies	December 31, 2027
Integrating them into the Forest Carbon Management tool	June 30, 2028

### Activity 3: Assess the tradeoffs and synergies among forest management objectives

**Activity Budget:** \$124,678

#### Activity Description:

In collaboration with our stakeholders, we will define a set of scenarios with different timber production, wildlife habitat, and carbon credit targets and develop the production possibility frontier curve that could inform about the tradeoffs of the production of each forest management goal. We will also perform a sensitivity analysis with several carbon offset prices to assess the impact of the carbon offset price changes on the willingness to join a carbon program and the long-term condition of the forest.

Applying a landscape-level perspective along with implementing several scenarios into Woodstock Optimization Studio, we will answer questions such as: To what extent are these management objectives competing with each other? What are the wood fiber supply impacts associated with implementing IFM projects at various levels across the state's forest land base? What are the potential opportunities to integrate IFM and timber management or wildlife objectives in the forest management decision-making process, and what are the impacts on carbon and wood fiber supply?

Results from a recent LCCMR proposal recommended for funding (proposal ID: 2025-075) will be fully incorporated in Milestone number 2 on Activity 3.

#### Activity Milestones:

Description	Approximate Completion Date
Define timber production target scenarios	January 31, 2029
Define wildlife habitat scenarios	January 31, 2029
Identifying tradeoffs and synergies among forest management planning objectives (Woodstock Optimization Studio)	June 30, 2029

### Activity 4: Redefining forest carbon credits markets to enhance resiliency in Minnesota's forests

**Activity Budget:** \$2,000

#### Activity Description:

Our final activity focuses on future developments, specifically a project that links key results with recent carbon assessment studies developed by other stakeholders in Minnesota.

This activity will utilize the findings from Activities 3 and 4 to explore innovative Integrated Forest Management (IFM) strategies aimed at bolstering the resilience of Minnesota's forests through active management in the face of climate-driven change. These strategies will consider specific silvicultural treatments and schedules tailored to the region's forest types and ecosystems, looking for economically viable options either with or without the sale of carbon credits. For instance, certain forest types like red pine and Northern hardwoods can store significant biomass (and carbon) late in their life cycles, whereas others, such as aspen and birch, may require earlier management interventions or tend to break up and give way to later successional stages.

This approach will assess the unique trade-offs between deferring management and maximizing carbon storage for different forest types. By redefining IFM strategies to better fit Minnesota's unique forest landscape, we aim to uncover insights that create synergies across forest management goals and ultimately enhance the resilience of these ecosystems.

#### Activity Milestones:

Description	Approximate Completion Date
Development future LCCMR grant proposal	February 28, 2029



## Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Mike Kilgore	University of Minnesota	Co-Principle Investigator (Co-Pi)	No
Lane Moser	University of Minnesota	Outreach and extension	Yes
Brian Anderson	Forest Carbon Works	Forest Carbon Market expert	No
Nathan T. Heibel	Koochiching County Land & Forestry	Forest Management expert	No
Mark P. Westphal	Carlton County Land Department	Forest Management expert	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 work be funded?**

This study will be developed through consultation with county land departments, private landowners, and the Minnesota Department of Natural Resources Division of Forestry. The University of Minnesota Extension is also a collaborator in this project, providing expertise in outreach external stakeholders during its completion and helping disseminate the findings at the end.

The results will be shared with the previous agencies as well as other local governments, the US Forest Service and policymakers to improve the long-term effectiveness and balance of carbon credit markets aiming to enhance carbon storage in Minnesota's forests while maximizing multiple ownership objectives.

## Project Manager and Organization Qualifications

**Project Manager Name:** Irene De Pellegrin Llorente

**Job Title:** Research Assistant Professor

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

Dr. De Pellegrin Llorente is a Research Assistant Professor at the University of Minnesota in Forest management planning and the Bioeconomy with more than 10 years of experience developing forest planning models in Minnesota and abroad. More than five years of experience in grant activities in academia, leading other grant efforts as a PI and Co-Pi in other grants.

Dr. De Pellegrin Llorente will supervise grant collaborators, staff, and budget, track expenses, and oversee project completion within established timelines for the three activities presented. In addition, I will provide scientific leadership and offer subject matter expertise for the three activities, specifically Activity 3.

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

**Organization Description:**

For over 100 years, the Department of Forest Resource at the University of Minnesota has been the leader in producing high quality research regarding natural resource management issues across the state of Minnesota.

The College of Food, Agricultural, and Natural Resource Sciences (CFANS) at the University of Minnesota (UMN) conducts broad-based, collaborative, and interdisciplinary research. We discover and disseminate knowledge that

contributes to the sustainable and wise use of resources, promotes economic and social opportunities, and supports policy-making.

## Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	\$ Amount
<b>Personnel</b>								
Irene De Pellegrin Llorente		Principal Investigator			36.6%	0.39		\$56,683
Lane Moser		Outreach and extension			36.6%	0.18		\$17,827
To Be Determined		Post Doc Researcher			25.9%	3		\$239,766
							<b>Sub Total</b>	<b>\$314,276</b>
<b>Contracts and Services</b>								
							<b>Sub Total</b>	-
<b>Equipment, Tools, and Supplies</b>								
							<b>Sub Total</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	Traveling for the PI and two of the Co-Pi's. The cost is estimated at \$100 per day and includes mileage/vehicle rental, lodging, and per diem.	Organize workshops, seminar and meetings with wildlife experts and other stakeholders, during the project and at the end of the project to provide results					\$1,000
	Conference Registration	One conference a year in Minnesota for the PI or Co-PI	To present current state of the project, data findings and results					\$4,500



	Miles/ Meals/ Lodging							
							<b>Sub Total</b>	<b>\$5,500</b>
<b>Travel Outside Minnesota</b>								
	Conference Registration Miles/ Meals/ Lodging	One conference at the end of the project outside Minnesota to present results	To present data findings and results to a broader audience					\$3,500
							<b>Sub Total</b>	<b>\$3,500</b>
<b>Printing and Publication</b>								
							<b>Sub Total</b>	<b>-</b>
<b>Other Expenses</b>								
		Open access publication costs	Publish the results of the project in peer-reviewed academic journals					\$4,724
							<b>Sub Total</b>	<b>\$4,724</b>
							<b>Grand Total</b>	<b>\$328,000</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	Unrecovered Indirect Costs UMN (54% overhead)	Operating costs of the UMN	Secured	\$177,120
			<b>State Sub Total</b>	<b>\$177,120</b>
<b>Non-State</b>				
In-Kind	Minnesota Agriculture Experimental Station	Dr. Mike Kilgore provides his time as in-kind support	Secured	\$37,968
			<b>Non State Sub Total</b>	<b>\$37,968</b>
			<b>Funds Total</b>	<b>\$215,088</b>

**Total Project Cost: \$543,088**

**This amount accurately reflects total project cost?**

Yes

## Attachments

### Required Attachments

#### *Visual Component*

File: [6a427ae4-5b4.pdf](#)

#### *Alternate Text for Visual Component*

The visual shows a map of the state of Minnesota highlighting where forests are located and the range of ecosystem services that Minnesota's forests provide. Pictures highlight forests, wildlife, timber, and flowers in the understory. The text provides a background of the topic, the problem, the solution and project outcomes...

### Supplemental Attachments

*Capital Project Questionnaire, Budget Supplements, Support Letter, Photos, Media, Other*

Title	File
Minnesota Forest Resources Council - Support letter	<a href="#">534dc8aa-c44.pdf</a>
University of Minnesota Approval	<a href="#">2ba35711-8d9.pdf</a>

## Administrative Use

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

No

**Do you understand that travel expenses are only approved if they follow the "Commissioner's Plan" promulgated by the Commissioner of Management of Budget or, for University of Minnesota projects, the University of Minnesota plan?**

Yes, I understand the UMN Policy on travel applies.

**Does your project have potential for royalties, copyrights, patents, sale of products and assets, or revenue generation?**

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 pre-design, design, construction, or renovation of a building, trail, campground, or other fixed capital asset costing \$10,000 or more or large-scale stream or wetland restoration?**

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 as "the provision of care,**

treatment, education, training, instruction, or recreation to children")?

No

**Provide the name(s) and organization(s) of additional individuals assisting in the completion of this proposal:**

Mike Kilgore, University of Minnesota

**Do you understand that a named service contract does not constitute a funder-designated subrecipient or approval of a sole-source contract? In other words, a service contract entity is only approved if it has been selected according to the contracting rules identified in state law and policy for organizations that receive ENRTF funds through direct appropriations, or in the DNR's reimbursement manual for non-state organizations. These rules may include competitive bidding and prevailing wage requirements**

N/A

