



## Environment and Natural Resources Trust Fund

M.L. 2026 Draft Work Plan

### General Information

**ID Number:** 2026-307

**Staff Lead:** Noah Fribley

**Date this document submitted to LCCMR:** December 12, 2025

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

**Project Budget:** \$300,000

### 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

**Web Address:** <https://cfans.umn.edu/>

### Project Reporting

**Reporting Schedule:** April 1 / October 1 of each year.

**Project Completion:** June 30, 2029

**Final Report Due Date:** August 14, 2029

### Legal Information

**Legal Citation:**

**Appropriation Language:**

**Appropriation End Date:** June 30, 2029

## Narrative

**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.

**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?**

We will produce a detailed report and at least one peer-reviewed publication based on the findings from this project, offering valuable insights into forest management planning. Specifically, the outcomes showing the trade-offs between forest management objectives will provide guidance on the impact of on-the-ground management in the short- and long-term of Minnesota's forests, which are of interest to natural resource management agencies, non-industrial private landowners, forest industry partners in Minnesota, and the general public. Ensuring Minnesota sustainably maintains economic, ecological, and social services from its forests not only benefits managers and policymakers but also all citizens across the state.

## 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

## Activities and Milestones

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

**Activity Budget:** \$82,327

#### 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
Update and develop statewide forest inventory	December 31, 2026
Reviewing, updating, and/or developing growth and yield models for the main forest cover types	June 30, 2027
Define the set of forest management goals, objectives, and strategies for state and county forest	June 30, 2027
Define the set of forest management goals, objectives, and strategies for private landowners	June 30, 2027

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

**Activity Budget:** \$102,370

#### 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
Defining baseline scenarios: Integrating of all milestones of Activity 1 into Woodstock Optimization Studio	December 31, 2027

Defining forest management scenarios for carbon sequestration using different improved forest management strategies	December 31, 2027
Forest Carbon Management tool runs: Integrating milestone 1 and 2 into the carbon model	June 30, 2028
Creation of a summary report with potential impacts of IFM projects implementation in MN	September 30, 2028

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

**Activity Budget:** \$115,303

#### 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?

#### Activity Milestones:

Description	Approximate Completion Date
Define potential and realistic timber production target scenarios, based on results from M1	January 31, 2029
Define potential forest carbon scenarios, based on results from M2	January 31, 2029
Woodstock Optimization Studio runs: identifying tradeoffs and synergies among forest management planning objectives	June 30, 2029
Publication of final report with project findings	June 30, 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

## Dissemination

**Describe your plans for dissemination, presentation, documentation, or sharing of data, results, samples, physical collections, and other products and how they will follow ENRTF Acknowledgement Requirements and Guidelines.**

This study will be conducted involving key forest stakeholders in Minnesota, such as Carlton and Koochiching Counties, from the beginning of the project. A Forest Carbon Analyst with more than a decade of experience in biometrics and forest carbon markets will provide expertise in Activities 1 and 2. Their network in the Forest Carbon Market arena will help reach an audience outside Minnesota. Three faculty members and a researcher from the Department of Forest Resources at the University of Minnesota will provide expertise on forestry aspects in Activities 1, 2, and 3. The University of Minnesota Extension is an active partner in this project with dedicated time for outreach and dissemination purposes.

Before and during the completion of this project, we will involve other county land departments and local governments in regular meetings, as well as the Minnesota Department of Natural Resources, Division of Forestry. We will share details of the project and ask for their participation. In addition, we will attend local conferences in Minnesota annually, such as the annual Minnesota Society of American Foresters conference and the Forest Resources Association Lake States Region Meeting, to reach different audiences and gain diverse feedback that we can incorporate into the project.

After the completion of the project, the results will be shared with the previous agencies, policymakers, the US Forest Service, and the citizens in Minnesota in a very accessible way. We will also use other outlets such as webinars, posts, technical reports, and peer-reviewed publications to reach a broader audience.

In all of our material and products, we will appropriately acknowledge the Environment and Natural Resources Trust Fund through the use of the trust fund logo or attribution language on project print and electronic media, publications, and other communications per the ENRTF Acknowledgment Guidelines.

## 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.

## 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		\$56,324
Lane Moser		Outreach and extension			36.6%	0.1		\$8,471
To Be Determined		Post Doc Researcher			25.9%	2.82		\$226,705
							<b>Sub Total</b>	<b>\$291,500</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 within Minnesota for the PI and two of the Co-PI's. Total 2 trips and an average of two days (one night). The cost is estimated at \$177 per day and includes vehicle rental, lodging, and per diem.	Organize workshops, seminar and meetings with 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. Total 3 trips during the project. Each conference will be in a different location each year. Estimated	To present current state of the project, data findings and results					\$2,500



	Miles/ Meals/ Lodging	costs: conference registration \$300, and an estimated cost of \$177 per day that includes vehicle rental, lodging, and per diem. Duration of each trip is 3 days. Average estimated cost of each trip is \$835						
							<b>Sub Total</b>	<b>\$3,500</b>
<b>Travel Outside Minnesota</b>								
	Conference Registration Miles/ Meals/ Lodging	One conference at the end of the project outside Minnesota to present the final results of the project for one person only	To present data findings and results as a formal presentation to a expert audience	X				\$2,000
							<b>Sub Total</b>	<b>\$2,000</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					\$3,000
							<b>Sub Total</b>	<b>\$3,000</b>
							<b>Grand Total</b>	<b>\$300,000</b>

## Classified Staff or Generally Ineligible Expenses

Category/Name	Subcategory or Type	Description	Justification Ineligible Expense or Classified Staff Request
<b>Travel Outside Minnesota</b>	Conference Registration Miles/Meals/Lodging	One conference at the end of the project outside Minnesota to present the final results of the project for one person only	The justification for this out-of-state travel is to attend the leading US conference on forest carbon management and forest planning modeling. The person attending this conference will participate in at least one formal presentation about the project findings and results, and how they will impact short and long-term forest management on the ground in Minnesota.

## 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: \$515,088**

**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
University of Minnesota Approval	<a href="#">2ba35711-8d9.pdf</a>
Minnesota Forest Resources Council - Support letter	<a href="#">534dc8aa-c44.pdf</a>
2026_307_research_addendum_Final	<a href="#">9f047055-4ea.docx</a>

### Difference between Proposal and Work Plan

#### *Describe changes from Proposal to Work Plan Stage*

We modified the budget to match the dollar amount recommended for funding. We added a description of the dissemination efforts planned for this project. We addressed the one comment on Tab 10.

## Additional Acknowledgements and Conditions:

The following are acknowledgements and conditions beyond those already included in the above workplan:

**Do you understand and acknowledge the ENRTF repayment requirements if the use of capital equipment changes?**

N/A

**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 project:**

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