



Environment and Natural Resources Trust Fund

M.L. 2023 Approved Work Plan

General Information

ID Number: 2023-186

Staff Lead: Corrie Layfield

Date this document submitted to LCCMR: June 1, 2023

Project Title: Maximizing Lowland Conifer Ecosystem Services: Phase 2

Project Budget: \$482,000

Project Manager Information

Name: Marcella Windmuller-Campione

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Project Reporting

Date Work Plan Approved by LCCMR: June 22, 2023

Reporting Schedule: January 1 / July 1 of each year.

Project Completion: June 30, 2026

Final Report Due Date: August 14, 2026

Legal Information

Legal Citation: M.L. 2023, Chp. 60, Art. 2, Sec. 2, Subd. 03m

Appropriation Language: \$482,000 the first year is from the trust fund to the Board of Regents of the University of Minnesota to continue monitoring forested peatland hydrology and wildlife, conduct new wildlife and habitat surveys, and quantify carbon storage to provide support for management decisions.

Appropriation End Date: June 30, 2026

Narrative

Project Summary: Continue monitoring forested peatland network for hydrology and wildlife including a new species, bog lemming. Add measures to quantify above and below ground carbon by age and forest type.

Describe the opportunity or problem your proposal seeks to address. Include any relevant background information.

Peatland forests account for 20% of all forestland within Minnesota and provide many ecosystem services. However, our knowledge of these systems is limited because they are typically in remote, difficult to access locations. Minnesota's forested peatlands are expected to be greatly impacted by changing climatic conditions because they are at their southern range limit, are sensitive to changes in hydrology, and contain low tree diversity.

With previous allocations from the ENRTF, we established a network of 48 peatland sites that represent a range of forest types and ages to assess vegetation, hydrology, and wildlife use resulting in improved knowledge that helps managers to maximize ecosystem benefits including clean water supply, fiber production, and wildlife habitat.

However, this work has also highlighted information gaps. There is tremendous uncertainty regarding the role peatlands play in climate mitigation (via carbon storage and sequestration (including harvested material)) and how we can manage them to sustain critical timber resources and maintain habitat quality. Questions also remain about habitat usage by several Species of Greatest Conservation Need that rely on peatland habitats including boreal chickadees and bog lemmings. Continued research is critical to guide the development of holistic and effective adaptive forest management recommendations.

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.

During Phase 1, we documented 114 wildlife species and 140 plant species within our network of 48 peatland forest study sites, filling critical information needs. More data are needed. We propose a three-prong approach that 1) continues monitoring of vegetation, wildlife, and hydrology these sites, 2) adds additional data to measure carbon stores (above and below ground) and bog lemming habitat use, and 3) utilizes a holistic approach (wildlife, vegetation, hydrology, carbon, and soils) to develop adaptive forest management recommendations to ensure continued economic and ecological productivity in Minnesota's peatland forests.

This proposal is supported by public land managers (MN DNR manages the largest percent of peatland forests in the state), private industrial forestry organization (UPM Blandin utilizes black spruce in their Grand Rapids mill), and conservation organizations (The Nature Conservancy is actively working on adaptive forest management), because it offers continued opportunity to maximize existing benefits provided by peatlands and science-based solutions for improving management to address new conditions associated with a changing climate.

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 Minnesota Forest Resources Council's assessment of priority research needs on sustaining forests specially identified the need to "Determine relationships between the spatial arrangement of forest conditions (age class structure, cover types, etc.) and forest resources (e.g., fiber productivity, water, wildlife, etc.)." Our research is filling this critical information need. By maintaining peatland forests, Minnesotans will enjoy the benefits of clean water, wildlife habitat, recreation, direct and indirect economic revenue through commercial forest products and recreation, carbon storage, and the quintessential fall colors from eastern larch - a conifer tree that turns gold in the fall.

Project Location

What is the best scale for describing where your work will take place?

Region(s): NE, NW, Central,

What is the best scale to describe the area impacted by your work?

Statewide

When will the work impact occur?

During the Project

Activities and Milestones

Activity 1: Continued monitoring of the peatland forest network with additional wildlife surveys and habitat assessments.

Activity Budget: \$246,260

Activity Description:

By June of 2022 we will have four continuous years of data from our network; this represents less than 5% of the average life cycle of these forests. Continued monitoring is necessary to fully capture the dynamics of potential conditions including impacts to hydrology during warm and wet winters compared to warm and dry summers and whether these conditions influence vegetation and breeding bird communities. Specifically we will: 1) maintain monitoring wells and precipitation gauges to collect continuous, hourly measurements of water table fluctuations to estimate water budget components on an annual basis; 2) monitor and assess breeding bird and amphibian communities; 3) assess Boreal Chickadee productivity and habitat use in the post-fledgling period; 4) conduct small mammal surveys in focal sites to determine distribution, density and habitat requirements for bog lemmings (a species of special concern since 1984); and 5) develop metrics of habitat quality for Species in Greatest Conservation Need across forested peatlands.

Activity Milestones:

Description	Approximate Completion Date
Establishment of Bog Lemming Sampling Design	September 30, 2023
Maintaining quality of hydrology data collection	October 31, 2023
Continued monitoring of network of 48 plots through 2025	December 31, 2025
Completion and summary of bog lemming surveys data	December 31, 2025
Create habitat quality metrics for Species in Greatest Conservation Need	January 31, 2026
Analysis and summary of six years of monitoring data to be used in Activity 3	February 28, 2026

Activity 2: Quantify above and below ground carbon

Activity Budget: \$201,390

Activity Description:

We will conduct a comprehensive sampling campaign to estimate total carbon pools on focal sites within the network. Data on carbon storage is another critical ecosystem service related to climate change mitigation and has the potential to generate revenue for landowners in emerging carbon markets. To quantify aboveground carbon pools, we will measure all aspects of above ground vegetation (trees, shrubs, moss, etc.). For belowground carbon pools, we will sample soils (primarily peat) and quantify other belowground pools (e.g., stumps, roots). This data will be summarized in the field and in the lab through multiple analyses to provide critical information about carbon storage and sequestration in these systems.

Building from individual sites to a broader region, we will utilize new technology through a terrestrial LiDAR scanner. Combining the high-resolution data from the LiDAR scanner with detailed on-the-ground measurements, we will quantify and map carbon pools (above ground & below ground) at local network sites and link these data to national forest inventory data across the state.

Activity Milestones:

Description	Approximate Completion Date
Establishment of Carbon Sampling Protocol	January 31, 2023

Testing of Lidar Sampling Method	August 31, 2023
Comprehensive sampling of above and below ground carbon pools on focal network sites	November 30, 2024
Analysis and summary of carbon pool	May 31, 2025
Scanning of focal sites with a terrestrial Lidar scanner	November 30, 2025
Develop of a statewide map of carbon pools	March 31, 2026

Activity 3: Develop an Ecosystem Risk Metric: Identification of High Risk Forest Ecosystems and Wildlife Habitat

Activity Budget: \$34,350

Activity Description:

Peatland forest conditions are rapidly changing and continued data collection is critical to fully understand and maximize the ecosystem benefits from peatland forest systems, including the future potential of maintained or increased carbon storage. By analyzing and utilizing the multiple factors assessed in this project (wildlife habitat use, forest productivity, hydrology, and carbon), we can develop a holistic ecosystem risk metric to identify which forest ecosystems and wildlife habitats will be most at risk to changing conditions. The risk metric will allow natural resource managers to strategically prioritize management or assess trade-offs among multiple ecosystem factors with the aim of reducing risk and increasing resilience. For example, a management action focused on increasing tree density may result in increased carbon storage but may not be ideal for certain bird species. By developing a risk metric that is relevant at a landscape scale, we will provide data visualization tools to display potential trade-offs among management strategies with the goal of maximizing ecosystem services. This holistic approach assessment will facilitate transparency in the forest management decision-making process.

Activity Milestones:

Description	Approximate Completion Date
Gathering Initial Thoughts from Managers on Metrics	October 31, 2024
Development of risk metric utilizing data from Activity 1 and 2	November 30, 2025
Creation of data visualization tool to display management and assess trade-offs	May 31, 2026

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Alexis Grinde	NRRI	Co-PI	Yes
Christopher Edgar	University of Minnesota	Co-PI	No
Robert Slesak	USDA Forest Service	Co-PI	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.

We are very active in our dissemination. Since this work was developed collaboratively with project partners, we are regularly sharing results through field visits, webinars, and papers. In all of our material, we will appropriately give credit to the Environment and Natural Resources Trust Fund through use of the trust fund logo or attribution language on project print and electronic media, publications, signage, 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?

The initial investment in the project (Phase 1) captures the geographic range as well as ranges of productivity and cover types in peatland forests in Minnesota, providing critical baseline information. However, given the complexity of issues facing Minnesota's peatlands, more information is urgently needed. We are requesting additional funds to build on our research which will continue to be shared through local, regional, and national outlets, allowing Minnesota to be a leader in the knowledge and sustainable management and conservation of peatland forests. Further, project partners have indicated their intent to directly incorporate our findings into operational practice.

Other ENRTF Appropriations Awarded in the Last Six Years

Name	Appropriation	Amount Awarded
Peatland Forest Management	M.L. 2018, Chp. 214, Art. 4, Sec. 2, Subd. 03d	\$600,000

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	\$ Amount
Personnel								
M. Windmuller-Campione/Summer Salary		Project Lead			33.5%	0.12		\$16,997
A. Grinde/Researcher		Co-PI, Lead on Wildlife			33.5%	0.24		\$21,245
Researcher 5		Data collection and analysis of vegetation and above ground carbon			33.5%	1.35		\$114,288
Researcher 5		Hydrology, Carbon Soil, Lab Analysis			33.5%	1.35		\$114,288
Post Doc		Carbon Lidar Scanning and Mapping			28.7%	0.6		\$39,383
Research Scientist NRRI		Wildlife surveys (breeding bird, amphibians, and bog lemmings)			33.5%	1.6		\$89,834
Graduate Student		Summer GRA - wildlife surveys			19.9%	0.14		\$12,646
Undergraduate Student Field Techs		Assisting in the collection of data for Activities 1 and 2			0%	0.11		\$14,019
Telemetry Specialist		Telemetry sampling			8%	0.06		\$2,000
							Sub Total	\$424,700
Contracts and Services								
UMN Soils Lab	Internal services or fees (uncommon)	Detailed analysis for carbon within vegetation, soils, and other pools				0.1		\$6,500
							Sub Total	\$6,500
Equipment, Tools, and Supplies								
	Equipment	30 cameras	to track nestling survival, hatch date, and predation events (\$150 ea.)					\$4,500
	Equipment	100 transmitters	To attach to birds to track their movements (\$150 ea.)					\$15,000
	Equipment	Telemetry Receiver	To track birds					\$3,800

	Tools and Supplies	Consumable Samping Supplies	Flagging, write in the rain paper, and other consumable sampling supplies to collect data for Activity 1 and 2					\$2,000
							Sub Total	\$25,300
Capital Expenditures								
							Sub Total	-
Acquisitions and Stewardship								
							Sub Total	-
Travel In Minnesota								
	Miles/ Meals/ Lodging	We estimate 250 total travel days between Activity 1 and Activity 2 which will be split among 4 researchers, 3 field techs, graduate student, a post-doc, and the PI's and CO-PI's. We estimate \$100 per individual travel event which includes lodging, per diem, and vehicle mileage/rental.	A high travel budget is required due to collection field data across the state in difficult to access and remote locations. During Phase 1 of this project, our project team covered 30,000 miles					\$25,500
							Sub Total	\$25,500
Travel Outside Minnesota								
							Sub Total	-
Printing and Publication								
							Sub Total	-
Other Expenses								
							Sub Total	-
							Grand Total	\$482,000

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				
In-Kind	Unrecovered Indirect Costs UMN (54% overhead)	Operating costs of the UMN	Secured	\$270,000
			State Sub Total	\$270,000
Non-State				
			Non State Sub Total	-
			Funds Total	\$270,000

Attachments

Required Attachments

Visual Component

File: [99d1e5f5-abf.pdf](#)

Alternate Text for Visual Component

The visual highlights the range of ecosystem services that peatlands provide and the knowledge gains we have made related to vegetation communities, wildlife species, water, and soils. We also have visuals of our partner organizations....

Optional Attachments

Support Letter, Photos, Media, Other

Title	File
U of MN submission approval	d2c5cd39-93a.pdf
Background check	54f0be11-997.pdf

Difference between Proposal and Work Plan

Describe changes from Proposal to Work Plan Stage

Thank you - the only change I made was a request for updates on January and July to match up with fiscal calendar of the UMN

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 agree travel expenses must 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 agree to the UMN Policy.

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?

Yes, Sponsored Projects Administration