



Environment and Natural Resources Trust Fund

2027 Request for Proposal

General Information

Proposal ID: 2027-247

Proposal Title: Recovery of Forest Ecosystems and Wildlife After Fire

Project Manager Information

Name: Danielle Ignace

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

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Project Basic Information

Project Summary: Our project creates a unique long-term dataset to understand the response and recovery of people, animals, plants, water, and soil after the Pagami and Greenwood Fires in Northern Minnesota.

ENRTF Funds Requested: \$634,000

Proposed Project Completion: June 30, 2030

LCCMR Funding Category: Resiliency (A)

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 and In the Future

Narrative

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

Fire plays an important role in the landscape and serves as a crucial natural resource management tool in Minnesota. In some cases, this is “good” fire and in other cases it is uncontrolled wildfire. Wildfires are predicted to increase in frequency and severity in Minnesota due to increased growing season temperatures and longer stretches of drought conditions creating greater opportunities for severe fire conditions.

We are seeing this increased frequency and severity of wildfire in Minnesota and the resulting impacts to our forests and communities. The Pagami Creek fire (August – October 2011) represents the largest wildfire since 1918 to impact Minnesota after it burned over 92,000 acres. More recently, the Greenwood Fire was detected on August 15, 2021, in the Superior National Forest that burned over 26,000 acres including hundreds of homes.

While it is common to see extensive research and recovery actions post wildfire, combining these efforts with pre-wildfire information is rare. We have a unique opportunity to fill this knowledge gap due to our extensive research in the region pre-wildfire. We can build on this information to create a unique long-term dataset to understand recovery and the implications for humans, vegetation, soils, and wildlife.

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.

We aim to build a unique long-term dataset and investigate how wildfire recovery affects ecosystem health and wildlife. By combining data taken prior to the Pagami Creek Fire and the Greenwood Fire with post-wildfire data, we will quantify recovery for vegetation, biodiversity, soils, and wildlife and help predict future wildfire risk.

Remote sensing products (forest composition and structure) were collected pre-wildfire. In the years immediately following wildfire, permanently established plots were used to collect soil and vegetation data. Field data, laboratory analysis, and remotely sensed data estimated high levels of carbon, nitrogen and mercury emission from the forest floor across a gradient of burn severity.

While many overstory trees were killed, there were large overstory red and white pine that survived. Using dendrochronology (tree cores), we can understand how growth changed after the fire. Additionally, new trees and understory species regenerated across a range of species. Aspen density was really high in some areas, creating habitat for moose, a culturally important species of greatest conservation need. Young, dense, large areas created by wildfire or harvesting are extremely important habitats for moose, but we do not fully understand how aspen recovery varies across wildfire severities and how that shapes moose habitat.

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?

Boundary Waters Canoe Area Wilderness and the surrounding forest ecosystems are Minnesota’s crown jewels. They represent important areas for tourism, recreation, and conventional timber products providing ecological, cultural, and economic services. Documenting impacts from wildfire will enhance our knowledge of wildfire management and mitigation, conserving critical ecosystem services that all Minnesotans benefit from.

Activities and Milestones

Activity 1: Reassess vegetation and forest ecosystem health

Activity Budget: \$156,838

Activity Description:

We will quantify the influence of fire on forest communities by developing a unique dataset that pairs pre-fire data with post-fire data. We will be able to understand changes and recovery in forest ecosystem health, vegetation composition and structure, and culturally important species from the Pagami Creek and Greenwood fire in northern Minnesota through resampling. Remotely sensed data on forest cover will be used to understand pre-fire conditions. Permanent plots were established the first growing season after the fire - 2012 for Pagami Creek and 2022 for Greenwood. These plots were established across a gradient of fire severity - from low severity to high severity and unburned areas. We will revisit and remeasure these plots using standard forest inventory metrics to quantify the overstory and regeneration layer. We will use quadrats to assess the herbaceous layer including culturally important species for Indigenous communities in Minnesota. We will calculate metrics of forest composition and structure and how these metrics have changed overtime; this will include metrics of species diversity, density, and how species grew after fire. Data will inform future management consideration to reduce uncontrolled wildfire in our fire dependent forest communities and surrounding human landscape.

Activity Milestones:

Description	Approximate Completion Date
Soil sampling within vegetation plots for nutrient, carbon storage, and pollution status	September 30, 2028
Sampling of a minimum of 75 number of forest vegetation plots for diversity and structure	September 30, 2029
Data analysis comparing pre- and post-fire vegetation, culturally important species, and soil response to fire	January 31, 2030
Development a minimum of two peer reviewed journal articles on forest dynamics for each fire	January 31, 2030

Activity 2: Soil sampling within vegetation plots for nutrient, carbon storage, and pollution status

Activity Budget: \$166,163

Activity Description:

Our goal is to understand forest soil health recovery from the Pagami Creek and Greenwood fire in northern Minnesota by resampling previously established permanent plots. We seek to quantify changes in soil nutrient status, carbon storage, and pollution (mercury) levels across the fire severity gradient. This information will be paired with vegetation data obtained through Activity 1. We will sample soils within the vegetation plots to fully understand ecosystem health response.

Activity Milestones:

Description	Approximate Completion Date
Soil sampling within vegetation plots for nutrient, carbon storage, and pollution status	September 30, 2028
Analyze soil samples for nutrient status and pollutants	May 31, 2029

Activity 3: Dendrochronology analysis of long-term living trees

Activity Budget: \$156,837

Activity Description:

We will research how recovery from wildfires are impacting forest regeneration. We will focus on living trees to sample tree rings. This information will help create past relationships with vegetation and fire. Establishing these relationships will guide our predictions for future changes in forests. For example, will recovering forests mostly consist of Jack Pine or will another species start to dominate these ecosystems? Finally, we will assess whether sampling dead tree stumps is possible, as they will enhance the full dataset.

Activity Milestones:

Description	Approximate Completion Date
Collect tree ring samples in living trees	August 31, 2028
Assess potential for sampling tree stumps	August 31, 2028

Activity 4: Relationships between vegetation and moose

Activity Budget: \$154,162

Activity Description:

Moose are iconic and culturally important species in northern Minnesota. They are also listed as species of greatest conservation need due to declining population numbers. There are many factors negatively impacting moose population numbers including diseases, impacts from changing summer and winter conditions, and interactions with other herbivore populations including deer. Moose are large animals and have large ranges; they prefer to eat young, dense aspen. Young dense areas of aspen regenerated after the Pagami Creek and Greenwood fire. We want to understand if and how moose might be using these areas to better understand features that can be mimicked in forest management. We will work with Grand Portage Band of Lake Superior Chippewa Natural Resource Managers and the Superior National Forest to develop sampling that can be completed on the permanent plots and in other forested areas to quantify metrics including browse and distance to other important habitat features including streams and riparian areas. Data will assist in understanding how forest vegetation influences moose habitat browse and use after fire and understanding how fire severity and time since fire influence the distribution and area of quality habitat.

Activity Milestones:

Description	Approximate Completion Date
Develop moose sampling protocol that can be adapted to permanently sampled plots for moose browse	November 30, 2027
Identify through GIS areas of good moose habitat that are not currently being sampled	April 30, 2028
Sample a minimum of 30 additional moose habitat plots	October 31, 2029
Analysis of moose browse and use of habitat	February 28, 2030
Incorporation of moose habitat requirements and influence of fire into management recommendation	June 30, 2030

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Marcella Windmuller-Campione	University of Minnesota	Co-lead supporting research planning, stakeholder engagement, and supervising students and technicians.	Yes
Michael Dockry	University of Minnesota	Co-lead supporting research planning, stakeholder engagement, and supervising students and technicians.	Yes

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.

The project PI and all project collaborators have strong ties and relationships with the forestry and fire communities across Minnesota. We will share our results through state, regional, and local meetings like the recent joint meeting in Duluth that brought together over 650 researchers and managers in areas of forestry, wildlife, and fisheries. We will also publish a minimum of 4 peer reviewed publications ensuring our data can be used to inform decision making in Minnesota and the broader region.

We will ensure data will be available and all data, resources, publications, and presentations will follow ENRTF acknowledgement requirements and 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 project is leveraging previous funding from NFS, the Forest Service, and the University of Minnesota to re-sample an already established network of plots. Our data represent critical long-term data which are needed to make management decisions. Since our project is collaborative with agencies, data can and will be incorporated into future management.

Project Manager and Organization Qualifications

Project Manager Name: Danielle Ignace

Job Title: Associate Professor

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

Dr. Danielle Ignace is an Indigenous (Coeur d'Alene Tribe) Associate Professor in the Department of Forest Resources at the University of Minnesota, a Research Associate at Harvard Forest, and Affiliated Faculty at the University of British Columbia. Dr. Ignace is an ecophysiologicalist who has devoted two decades studying how disturbances, fire, and introduced pests and plants affect ecosystem health and Indigenous communities across a range of ecosystems in Minnesota, New England, Idaho, and southern interior British Columbia (BC). More recently, Dr. Ignace has been working to restore threatened Palouse prairie ecosystems and developing a new forest management plan for the Coeur d'Alene Tribe to enhance culturally important species, biodiversity, ecosystem health and their co-benefits for community. She won the Excellence in Ecology award from the Ecological Society of America and serves as the Chair of their Traditional Ecological Knowledge Section, has served in leadership roles for the American Society of Plant Biology, and is an Associate Editor for *Elementa: Science of the Anthropocene*. Dr. Ignace has been a member of the Strategic Advisory Group for the Silviculture Innovation Program for the Bulkley Valley Research Centre (non-profit based in Smithers, BC, Canada), and a member of the Interim Strategic Advisory Committee for the British Columbia Parks

Foundation Fund to strategize the best ways to partner with stakeholders seeking to enhance and restore ecosystem health. Dr. Ignace is the chapter lead for the Drivers of Change of Nature chapter of the first-ever assessment of nature in the U.S (The Nature Record) working with members from federal, state, and local governments, as well as the academic, non-profit, and private sectors to create a full understanding of the status, trends, and future of U.S. lands, waters, and wildlife and the benefits they provide to the economy, health, climate, environmental justice, and national

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. Within the broader community of the College of Food, Agricultural and Natural Resource Sciences, there is a mission to develop, explore, and share applied knowledge and teaching related to natural resource communities.

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	\$ Amount
Personnel								
Danielle Ignace (summer salary)		Project Lead			36.6%	0.15		\$26,958
Marcella Windmuller-Campione (summer salary)		Co-Lead			36.6%	0.15		\$26,958
Mike Dockry (summer salary)		Co-Lead			36.6%	0.12		\$26,322
Laura Reuling/Researcher 5		Data collection, analysis, and writing			36.6%	0.84		\$97,044
Alan Toczydlowski		Data collection, analysis, and writing			36.6%	0.84		\$96,487
Graduate student researcher		Data collection, sample processes, field maintenance			36.6%	1.5		\$96,827
Graduate student researcher		Data collection, sample processes, field maintenance			36.6%	1.5		\$96,827
Graduate student researcher		Data collection, sample processes, field maintenance			36.6%	1.5		\$96,827
Undergraduate student		Assist with field collection, processing, and maintenance			0%	0.6		\$10,400
							Sub Total	\$574,650
Contracts and Services								
							Sub Total	-
Equipment, Tools, and Supplies								
	Equipment	Forestry equipment: loggers tape (3), laser hyposemeter height (1), write-in-the-rain books (10), flagging (20), increment borers (3)	Equipment to measure size of vegetation, record data, and mark trees and plots					\$5,350
	Tools and Supplies	Total C/N = \$20/sample Total Hg = \$10/sample Sample processing: drying, grinding, sieving = \$10/sample	Cost to analyze soil samples					\$12,000

		For 300 samples * \$40 sample, increment bore sharpening and tree core mounting supplies						
							Sub Total	\$17,350
Capital Equipment								
							Sub Total	-
Acquisitions and Stewardship								
							Sub Total	-
Travel In Minnesota								
	Miles/ Meals/ Lodging	Lodging: \$50/day per room, 2 rooms, 40 days a summer, 3 summers. Meals: \$50/day, 3 people, 40 days, years 1 and 2. Vehicle rental: \$500 per summer, 3 summers	Travel expenses for field trips in northern Minnesota					\$25,000
	Conference Registration Miles/ Meals/ Lodging	Years 2 and 3, Minnesota state conference registration and lodging	Dissemination of research outputs and education and outreach					\$3,000
	Miles/ Meals/ Lodging	2 trips per year x 10 people x \$500 per trip	Field tour to all contributing collaborators and researchers, as well as interested stakeholders					\$10,000
							Sub Total	\$38,000
Travel Outside Minnesota								
							Sub Total	-
Printing and Publication								
	Publication	Peer reviewed journal articles	Research dissemination					\$4,000
							Sub Total	\$4,000
Other Expenses								
							Sub Total	-
							Grand Total	\$634,000

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	-

Total Project Cost: \$634,000

This amount accurately reflects total project cost?

Yes

Attachments

Required Attachments

Visual Component

File: [f9249b19-e5f.pdf](#)

Alternate Text for Visual Component

A visual demonstrating a previously intact forest that has been impacted by a fire severity gradient. Our research activities will help us understand recovery from these wildfires and determine how we can manage and conserve culturally important species and overall forest ecosystem health in northern Minnesota....

Supplemental Attachments

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

Title	File
SPA Approval	83f6d91d-2b1.pdf

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?

Yes, Sponsored Projects Administration

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:

Andrea Little, 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