Environment and Natural Resources Trust Fund

2027 Request for Proposal

General Information

Proposal ID: 2027-489

Proposal Title: Tracking Change at Minnesota's Great Forest Boundary

Project Manager Information

Name: Peter Kennedy

Organization: U of MN - College of Biological Sciences

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Project Basic Information

Project Summary: Minnesota's two great forests meet at Itasca, and that boundary is shifting. This project re-measures 35,000 tagged trees, trains student scientists, and establishes a baseline before multiple pathogens arrive.

ENRTF Funds Requested: $443,000

Proposed Project Completion: June 30, 2030

LCCMR Funding Category: Fish and Wildlife (D)

Project Location

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

Region(s): NW

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.

Minnesota sits at the convergence of two major North American forests, and their boundary runs directly through Itasca State Park. In one direction lies the boreal forest, defined by needle-leaved conifer trees. In the other direction sits the temperate forest, where maples, oaks, and other broad-leaved trees dominate. Itasca is where these systems meet and are negotiating their boundary in real time. The first census of the 40 acre Itasca ForestGEO plot, completed between 2019 and 2024, documented more than 35,000 individual trees and shrubs and revealed a forest in active transition: sugar maple is recruiting into historically boreal areas, while iconic red and white pines are producing no seedlings. But a single census is a snapshot, not a story. Scientific and management value emerges only when the plot is measured again. An additional pressure makes this recensus urgent. Two major pathogens, emerald ash borer and oak wilt, are advancing northward toward Itasca but have not yet arrived. A recensus now establishes a pre-disease baseline of irreplaceable value.

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.

This project will conduct the first systematic recensus of the Itasca ForestGEO plot across three summer field seasons from 2027-2029, re-measuring every tagged individual and documenting new recruits. Work will be conducted by a University of Minnesota field team, with integrated participation by students from Waubun-Ogema-White Earth High School through the established White Earth-Itasca Internship program at the Itasca Biological Station and Laboratories. Each summer season, the field team will spend four weeks at the station conducting intensive recensus work. The ForestGEO protocol requires revisiting every previously tagged stem, recording current status and diameter, documenting mortality, and tagging, measuring, and mapping new recruits. Data are entered in real time using ForestGEO-standard tablet applications and backed up daily to a cloud repository. Te team will also conduct annual mortality and damage surveys assessing crown condition, trunk damage, and signs of decline in up to 5,000 individual trees per season. Further, non-structural carbohydrate sampling of approximately 250 focal trees per season will evaluate tree vigor at the physiological level. Together, these parallel efforts will produce a combined record of forest demography and individual tree health that can mechanistically explain how Minnesota's forests are changing, now and going forward.

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?

This project will produce a complete, quality-controlled recensus dataset for all 35,000-plus individually tagged trees and shrubs in the 16-hectare Itasca ForestGEO plot, establishing the first quantitative record of forest compositional change at this site and a pre-disease baseline of permanent scientific value. Results will be submitted to the global ForestGEO network database and deposited in the UMN Data Repository under a Creative Commons license. Findings will be distributed to the Minnesota DNR Division of Forestry, Itasca State Park, and White Earth Nation Natural Resources in a plain-language public report, and published in a peer-reviewed scientific journal.

Activities and Milestones

Activity 1: Recensus & Survey Field Seasons, Summers 2027-2029

Activity Budget: $299,858

Activity Description:
A field team consisting of the PI, co-PI Smith-Martin, 2 UMN graduate students, six UMN undergraduate student researchers, and two Waubun High School student interns will conduct a four-week intensive recensus of the Itasca ForestGEO plot during each of three summer seasons (summer 2027, 2028, and 2029), based at the UMN Itasca Biological Station and Laboratories (IBSL). The three-season structure follows the ForestGEO protocol for staggered recensus timing: each stem is re-measured five years after its initial measurement, and because the first census was conducted in stages from 2022–2024, the review of each cohort will be matched to its original measurement year across the three summers. Concurrent with each recensus season, this team will also lead annual mortality and damage surveys of up to 5,000 individual trees in the plot using the standardized ForestGEO AMS protocol. Survey teams (4 people, working in 2 pairs) assess visible tree health, crown condition, trunk damage, and signs of physiological decline. Approximately 250 focal individuals per season will receive non-structural carbohydrate (NSC) sampling, with tissue collected and processed at the UMN NSC lab to evaluate tree vigor at the physiological level.

Activity Milestones:

Description	Approximate Completion Date
Summer 2027 recensus and survey fieldwork complete; all data entered, backed up, and quality-checked	August 31, 2027
Summer 2027 recensus data analyses complete; samples processed for non structural carbohydrates	December 31, 2027
Summer 2028 recensus and survey fieldwork complete; all data entered, backed up, and quality-checked.	August 31, 2028
Summer 2028 recensus data analyses complete, samples processed for non-structural carbohydrates	December 31, 2028
Summer 2029 recensus and survey fieldwork complete; all data entered, backed up, and quality-checked.	August 31, 2029
Summer 2029 recensus data analyses complete, samples processed for non-structural carbohydrates	December 31, 2029

Activity 2: Data Integration, Analysis, and ForestGEO Network Submission

Activity Budget: $125,142

Activity Description:
Following each field season, the recensus dataset will be compiled, cross-validated against the original census database, and subjected to the ForestGEO network's standard data quality protocols. The PI and graduate students will conduct analysis of forest compositional change, with primary focus on: (1) species-level patterns of survival, growth, and mortality across the recensus interval; (2) quantification of sugar maple recruitment and spatial spread relative to the first census; (3) assessment of red pine and white pine regeneration; and (4) integration of mortality survey and physiological data with stem-level demographic patterns from the recensus.

The validated recensus dataset will be submitted to the ForestGEO network database at the Smithsonian Institution, making Minnesota's change data permanently available to the international research community. The dataset will also be deposited in the University of Minnesota Data Repository (DRUM) under a Creative Commons Attribution license with full metadata documentation.

Activity Milestones:

Description	Approximate Completion Date
Peer-reviewed scientific manuscript submitted	June 30, 2026
Full three-season recensus dataset merged with original census database; cross-validation complete	January 31, 2030
Primary analysis of species compositional change complete	March 31, 2030
Dataset submitted to ForestGEO network database (Smithsonian Institution)	April 30, 2030
Dataset deposited in UMN Data Repository (DRUM) with full metadata under Creative Commons license	April 30, 2030

Activity 3: Student Training, Outreach, and Public Reporting

Activity Budget: $18,000

Activity Description:

The Waubun-Ogema-White Earth High School student participation is structured as an explicit training program. Each summer that students have worked with the ForestGEO project at IBSL they have completed a structured learning arc: introduction to forest ecology and the ForestGEO network in week one; supervised data collection using all recensus methods in weeks one and two; independent data collection/analysis with peer review in week two; and a short end-of-season presentation to the IBSL community and Itasca State Park staff. UMN graduate and undergraduate students serve as peer mentors throughout. Students leave with documented field skills, a letter of reference from the PI, and a contributor credit on the ForestGEO dataset. To date, their participation has been facilitated through a donor-funded internship program offered at IBSL in collaboration with Waubun-Ogema-White Earth High School. The training is designed to open pathways to careers in natural resource management, specifically DNR forestry, tribal natural resources departments, and ecological consulting: areas of genuine workforce need in Minnesota's rural and tribal communities. At project completion, a plain-language public report will be produced summarizing recensus findings for a non-specialist audience: park visitors, landowners, legislators, and the general public.

Activity Milestones:

Description	Approximate Completion Date
Waubun-Ogema-White Earth student training program structure documented; shared with IBSL	March 31, 2027
Summer 2027 Waubun student end-of-season presentations completed at IBSL	June 30, 2027
Summer 2028 Waubun student end-of-season presentations completed at IBSL	June 30, 2028
Summer 2029 Waubun student end-of-season presentations completed at IBSL	June 30, 2029
Draft public summary report circulated to DNR, Itasca State Park, and White Earth Nation Resources	March 31, 2030
Final public report published and distributed; results presented at professional meeting	June 30, 2030

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Dr. Christina Smith-Martin	University of Minnesota	Dr. Smith-Martin will be the co-PI and lead the annual damager and mortality surveys and the non-structural carbohydrate analyses.	Yes
Itasca Biological Station and Laboratories	University of Minnesota	Field station host, housing and logistics for field team, administrative coordination of White Earth-Itasca Internship program. Contact: Dr. Jonathan Schilling.	No
Rebecca Dallinger	Waubun-Ogema-White Earth High School	School partner for highschool student interns. Rebecca Dallinger is the IBSL-Waubun partner liasion.	No
Louis Peterson	Minnesota DNR Division of Forestry	Plot land management and end-user of monitoring data for statewide forest management.	No
Emily Schilling	White Earth-Itasca Internship program	Administrative coordination of the White Earth-Itasca Internship program.	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.
All recensus data, results, and products will be disseminated through multiple complementary channels serving both the scientific community and Minnesota's resource managers:

ForestGEO Network Database (Smithsonian Institution): The full recensus dataset will be submitted to the ForestGEO network database following standard network data submission protocols. This database is accessible to researchers at all 85 ForestGEO sites worldwide, placing Minnesota's forest change data in direct comparison with sites across 29 countries. Submission will occur no later than six months after the final field season.

University of Minnesota Data Repository (DRUM): The complete documented dataset, which includes species identification records, spatial coordinate files, and full metadata will be deposited under a Creative Commons Attribution license. This ensures permanent, free, publicly accessible archiving with sufficient documentation for future use by any ecologist without requiring direct contact with the original research team.

Peer-Reviewed Publication: The PI and collaborators will prepare a peer-reviewed manuscript describing forest compositional change at the Itasca boreal-temperate ecotone, submitted to an open-access or hybrid journal.

Plain-Language Public Report: A non-technical summary will be distributed to the Minnesota DNR Division of Forestry, Itasca State Park management, White Earth Nation Natural Resources, and the LCCMR project portfolio, and published through the UMN digital conservancy.

Professional Presentations: Results will be presented at professional meetings including at minimum the Minnesota Forest Resources Council or the Ecological Society of America annual meeting.

Undergraduate Education: Data from the recensus will be integrated into the UMN CBS 'Nature of Life' freshman

orientation program, which currently uses first-census data from the Itasca plot, ensuring the monitoring data directly inform undergraduate education at Minnesota's largest public university.

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?
All primary deliverables, including the validated recensus dataset, ForestGEO network submission, public report, and trained students, will be completed before the grant closes. No ongoing expenditure is required to preserve or access these products. The 35,000-plus permanent tags, GPS coordinates, species maps, and census protocols that make the Itasca plot scientifically unique will remain in place and available to future researchers indefinitely. Future census cycles, anticipated on a roughly five-year schedule consistent with global ForestGEO standards, will be funded through subsequent competitive grants, including NSF's Long-Term Research in Environmental Biology program and future LCCMR applications.

Project Manager and Organization Qualifications

Project Manager Name: Peter Kennedy

Job Title: Professor

Provide description of the project manager's qualifications to manage the proposed project.
Dr. Peter Kennedy is a Professor in the Department of Plant and Microbial Biology at the University of Minnesota College of Biological Sciences, with research expertise in forest ecology, plant-microbial interactions, and long-term forest dynamics. He has conducted field research at Itasca State Park for more than 10 years and has deep familiarity with the ecological systems, institutional relationships, and logistics of working at IBSL.

Dr. Kennedy led the establishment of the Itasca ForestGEO plot beginning in 2019, designing and overseeing the first full census (2019–2024). He serves as the primary contact for the Smithsonian ForestGEO program at the Itasca site and has managed the plot's integration into the global network since its establishment. He has supervised UMN graduate and undergraduate students in forest inventory methods across multiple field seasons and co-coordinates with the Itasca Biological Station Leadership on the White Earth-Itasca Internship program, which has brought Waubun High School students to Itasca for field training during 5 summer field seasons.

Dr. Kennedy has successfully managed externally funded research grants totaling more than $3.2 million in direct costs to his laboratory as PI and co-PI, including $2.8 million at the University of Minnesota. Most directly relevant to this project, Dr. Kennedy served as PI on the Itasca Biological Station Seed-to-Root grant (2019–2022, $74,994) that established the ForestGEO plot this proposal seeks to recensus, and currently serves as co-PI on an NSF Long-Term Ecological Research award supporting multi-decadal forest ecosystem monitoring at Cedar Creek ($632,824 Kennedy lab share). His research relevant to this project has been published in top peer-reviewed journals, including Proceedings of the National Academy of Sciences and Global Change Biology.

Organization: U of MN - College of Biological Sciences

Organization Description:
The University of Minnesota College of Biological Sciences (CBS) is a research and teaching focused unit with decades of continuous investment in field ecology, biodiversity science, and environmental monitoring. CBS operates the Itasca Biological Station and Laboratories (IBSL), one of the oldest continuously operated inland field biology stations in the United States, established in 1909. IBSL provides the housing, laboratory space, and field station infrastructure for this

project. The University of Minnesota maintains robust sponsored research infrastructure for managing externally funded grants, including financial reporting, procurement, and compliance with state and federal requirements. The University's financial statements meet LCCMR financial capacity requirements for state entities.

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	$ Amount
Personnel								
Project PI		Peter Kennedy (PI) will oversee the entire project, including the 40-acre Itasca ForestGEO plot recensus and integration with the global Smithsonian network. He will lead the field team during three summer seasons (2027–2029) in re-measuring 35,000+ tagged trees and documenting new recruits as well as supervise data cross-validation, analysis of forest compositional change, and submission to international and university repositories. Dr. Kennedy will also coordinate the training program for Waubun High School and UMN students and leads the production of the final public report.			26.79%	0.36		$53,274
Project Co-PI		Dr. Christina Smith-Martin (Co-PI) will lead the annual mortality and damage Surveys (AMS) to assess the visible health, crown condition, and trunk damage of up to 5,000 trees per season. She will supervise the non-structural carbohydrate sampling and laboratory analysis for ~250 focal trees annually to evaluate tree vigor at the physiological level.			25.87%	0.12		$32,784
Grad students (equal 1 per academic year, 2 for summer)		UMN Graduate students will support the PI and Co-PI in leading field teams for the intensive four-week recensus and annual mortality surveys during the three summer seasons (2027–2029). After each field season, they will conduct primary analysis of forest compositional change, focusing on species-level patterns of survival, growth, and mortality. They will also conduct the non-structural carbohydrate sampling to integrate physiological data with stem-level demographic patterns to identify mechanisms driving forest change. Additionally, they will serve as peer mentors for UMN undergraduate researchers and Waubun High School interns during field seasons and data collection.			40,974%	1.62		$173,448
6 undergrad students		UMN undergraduate students will assist with fieldwork during each of the four-week field seasons			0%	0.63		$47,755

		in re-measuring 35,000+ tagged stems and mapping new recruits. They will also be part of the teams conducting the annual mortality and damage surveys.						
Temp/casual highschool students		Waubun-Ogema-White Earth High School student interns will participate in 2.5 weeks of each of the summer field seasons, gaining hands-on experience in long-term forest inventory methods data collection. They will work under the guidance of UMN mentors to develop independent data collection and analysis skills and seliver a short end-of-season presentation on field findings to the IBSL community and Itasca State Park staff.			7.4%	51		$10,692
Grad students		research stipend provided to each graduate each summer that can support their own research in the plot. They are receiving that additional funding as compensation for being the White Earth mentors, helping them with skills building, data analysis, and presentation preparation.			0%	0.24		$15,000
							Sub Total	**$332,953**
Contracts and Services								
							Sub Total	**-**
Equipment, Tools, and Supplies								
	Equipment	One-time purchase of two Haglof GPS Calipers ($7,500 total) and one research bicycle ($500)	Calipers for high-precision tree measurement and mapping, and one research bicyclefor efficient plot navigation between the Itasca Biological Station and research sites.					$8,000
	Tools and Supplies	Tree Census Tags ($2,000/year): Durable, industry-standard identification tags, Field Supplies & Hardware ($3,800/year): Includes plot corner stakes ($800), plot maintenance hardware such as nails, wire, and specialized forestry tools ($3,000), and high-visibility tree spray paint($1,700), PPE & Safety ($500/year): Essential protective gear, including permethrin-treated field jackets and insect repellent, Forestry Consumables & Maintenance	identification tags essential for maintaining long-term individual tree records across the census plots, stakes for permanent location tracking, paint for marking sample trees during census activities, PPE & Safety to ensure personnel safety from tick-borne illnesses and other hazards in remote field conditions,					$37,900

		($1,300/year): General forestry supplies (e.g., flagging, sample bags) and annual maintenance/tune-ups	Forestry Consumables & Maintenance for the research bicycle fleet to ensure operational readiness for daily fieldwork.					
							Sub Total	**$45,900**
Capital Equipment								
							Sub Total	**-**
Acquisitions and Stewardship								
							Sub Total	**-**
Travel In Minnesota								
	Miles/ Meals/ Lodging	Cabin rental (PI 1-bed @ $60/night + Cabin 70 for grad & undergrads @ $100/night × 28 nights × 3 seasons) Field station fees ($10/person/night: 9 people × 28 nights × 3 seasons + co-PI × 14 nights × 3 seasons) 24-hr drinks and evening snacks ($5/person/day: 9 people × 28 days + co-PI × 14 days × 3 seasons) Meals (dinners + weekend brunches: 9 UMN team × 36 events + co-PI × 18 events × 3 seasons @ $15) Travel: vehicle mileage to/from Itasca ($800 × 3 seasons) $2400	Personnel travel between the U of M St. Paul Campus and the field research site at Itasca for project oversight, equipment deployment, and data collection, Local travel for project-related site visits and procurement of field supplies not available at the field station.					$43,200
	Miles/ Meals/ Lodging	Waubun-Ogema-White Earth High School Students support: Cabin rental (1 cabin × 18 nights × 3 seasons @ $70/night) Field station fees ($10/person/night × 18 nights × 2 students × 3 seasons) 24-hr drinks and evening snacks ($5/person/day × 18 days × 2 students × 3 seasons) Meals (dinners + weekend brunches, 2 students × 3 seasons) Student wages (100 hrs × $16.50/hr × 2 students × 3 seasons) + fringe @ 7.65%	High School student support					$17,947
							Sub Total	**$61,147**

Travel Outside Minnesota								
							Sub Total	**-**
Printing and Publication								
	Publication	publication costs for peer reviewed journal	Necessary to make our results publicly available					$3,000
							Sub Total	**$3,000**
Other Expenses								
							Sub Total	**-**
							Grand Total	**$443,000**

Classified Staff or Generally Ineligible Expenses

Category/Name	Subcategory or Type	Description	Justification Ineligible Expense or Classified Staff Request

Non ENRTF Funds

Category	Specific Source	Use	Status	Amount
State				
			State Sub Total	**-**
Non-State				
In-Kind	The University of Minnesota	The University of Minnesota is not allowed to charge the State of Minnesota its typical overhead rate of 54% of the total modified direct costs. We are listing our unrecoverable indirect cost as in-kind contribution.	Secured	$239,094
			Non State Sub Total	**$239,094**
			Funds Total	**$239,094**

Total Project Cost: $682,094

This amount accurately reflects total project cost?

Yes

Attachments

Required Attachments

Visual Component

File: 0e2748c6-13a.docx

Alternate Text for Visual Component

Photos from the Itasca ForestGEO first census, 2022–2024...

Supplemental Attachments

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

Title	File
Board Letter	5bf57090-21e.pdf
Support Letter from IBSL	c852c01b-0e7.docx
One page summary of project	8a75cc4f-29f.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")?

Yes

Do you certify that background checks are performed for background check crimes, as defined in Minnesota Statutes, section 299C.61, Subd. 2, on all employees, contractors, and volunteers who have or may have access to a child to whom children's services are provided by your organization?

Yes

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

Lori Nicol

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