Environment and Natural Resources Trust Fund

2027 Request for Proposal

General Information

Proposal ID: 2027-392

Proposal Title: Minnesota's Lacustrine Systems: A Conservation Inquiry

Project Manager Information

Name: Thomas Rodengen

Organization: Creative Scientific

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Project Basic Information

Project Summary: Analyze the changes in watershed vegetation and associated lake carbon accumulation rate that are representative of the different biomes in Minnesota to promote future climate resiliency in land use management.

ENRTF Funds Requested: $148,000

Proposed Project Completion: July 31, 2028

LCCMR Funding Category: Small Projects (G)

Secondary Category: Resiliency (A)

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.

Public waters and their watersheds are statewide resources that are especially vulnerable to climate trends and changing land use. Findings in North America indicate that rising temperatures and intensified land use are key drivers of enhanced carbon accumulation rate (Dietz et. al., 2015; Rodengen et al., 2025). Assessing carbon accumulation rates and associated vegetation change across Minnesota's biomes is crucial to understanding the drivers and tailor conservation practices. The integration of palaeolimnological data into conservation practice is critical for effective ecosystem based management and climate resiliency. This proposal will support land use decisions that sustain these resources as carbon stores.

Dietz et. al., 2015 https://agupubs.onlinelibrary.wiley.com/doi/10.1002/2014GB004952
Rodengen et. al., 2025 https://www.facetsjournal.com/doi/10.1139/facets-2025-0006

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.

Paleolimnological data provides the long-term perspective on key ecological challenges and enables decision makers to better understand pre-disturbance conditions and possible responses to future change. Creative Scientific will analyze three lake sediment cores for historic vegetation change and carbon accumulation rate in three watersheds representing Minnesota's biomes. The three chosen lakes have existing, yearly, surface water data compiled as sentinel lakes (https://www.dnr.state.mn.us/fisheries/slice/index.html). The three lakes' loss-on-ignition (LOI) data will develop into a regression equation that is transferable to other Minnesota lakes. Existing Minnesota lake sediment LOI data will be mined to create a unified regression equation deriving a conversion factor from LOI to carbon accumulation rate.

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?

Adding carbon accumulation rate of three lakes to the Minnesota Pollution Control Agency EQuIS repository. Preparing a peer-reviewed journal article highlighting the carbon accumulation rate unified regression equation for Minnesota and connection to vegetation change. Developing a choice model for integrating carbon accumulation rate data with land use decision makers.

Activities and Milestones

Activity 1: Laboratory Development

Activity Budget: $125,000

Activity Description:
Warehouse space rental agreement for 1 year with realtor. Purchase, installation, and testing of equipment. Screening of two lab technicians by the lab director.

Activity Milestones:

Description	Approximate Completion Date
Lab space leased	July 31, 2027
Lab operational	September 30, 2027
Equipment installed and tested	September 30, 2027

Activity 2: Fieldwork

Activity Budget: $20,000

Activity Description:
Travel and collection of three lake sediment cores. Third-party dating of cores.

Activity Milestones:

Description	Approximate Completion Date
Fieldwork plan developed with permits acquired	September 30, 2027
Fieldwork equipment acquired and tested	September 30, 2027
Fieldwork completed	December 31, 2027

Activity 3: Creation of a Choice Model following Laboratory Analysis

Activity Budget: $3,000

Activity Description:
The development of a robust and predictive choice model is a critical undertaking that naturally follows a thorough laboratory analysis of the three lake sediment cores for vegetation and carbon accumulation rate. This process bridges the gap between controlled, experimental observation and real-world behavioral prediction. The choice model serves as a quantitative representation of decision-making, synthesizing the data collected during the laboratory phase into a structured, mathematical framework. Synthesis of laboratory data involves meticulously compiling and cleaning the data acquired from the laboratory analysis.With the data prepared, the next step is to specify the mathematical structure of the choice model. The selected model is then estimated using statistical software. This process involves finding the set of parameters (coefficients) that best explain the observed choices using the laboratory data. Before the choice model can be reliably used for forecasting, its validity and predictive accuracy must be rigorously tested. The ultimate goal is to use the choice model to simulate decision-making under new, untested future climate scenarios, allowing researchers and practitioners to predict behavior outside the confines of the original laboratory setting.

Activity Milestones:

Description	Approximate Completion Date

Lab analysis completed	March 31, 2028
Choice model developed	May 31, 2028
Validation of choice model	June 30, 2028
Peer-reviewed paper submitted	July 31, 2028

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.
Upload of paleolimnology data to EQuIS system managed by the Minnesota Pollution Control Agency. Submission of journal article highlighting LOI to carbon accumulation rate conversion factor for Minnesota to an open access peer-reviewed journal acknowledging funds from LCCMR. A choice model will be submitted to the Minnesota Environmental Quality Board.

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?
A choice model will be developed for land use managers in Minnesota, This choice model will be submitted to the Minnesota Environmental Quality Board. Training on the choice model will be available like the available Climate Calculator v1.2.

Project Manager and Organization Qualifications

Project Manager Name: Thomas Rodengen

Job Title: Chief Scientist

Provide description of the project manager's qualifications to manage the proposed project.
PhD in Resource and Environmental Management researching lakes and relaying results to public agencies.

Organization: Creative Scientific

Organization Description:
Environmental Consultancy

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	$ Amount
Personnel								
Lab Director		Oversee lab technicians. Safety of the lab. Ordering and cleanliness. Ensure Milestones are met.			0%	0.6		$60,000
Lab Technician		Conduct Analysis in the Laboratory of the three sediment cores.			15%	0.17		$15,000
Field Assistant		Aid in collection of three sediment cores across the state.			15%	0.17		$3,000
							Sub Total	**$78,000**
Contracts and Services								
							Sub Total	**-**
Equipment, Tools, and Supplies								
	Equipment	Fume Hood	Safely Prepare Vegetation and Carbon Analysis					$5,700
	Equipment	Muffle Furnace	Loss-on-ignition to ascertain organic matter and formulate carbon %					$2,800
	Equipment	Drying Oven	Sediment preparation for vegetation and varbon analysis.					$440
	Equipment	Hot Water Bath	Microscope slide preparation for vegetation analysis.					$1,097
	Equipment	Centrifuge	Sediment processing for vegetation and carbon analysis.					$188
	Equipment	Sediment Agitation	Sediment preparation for vegetation and carbon analysis.					$276
	Equipment	Microscope Slide Warmer	Slide preparation for vegetation analysis.					$56
	Equipment	Distilled Water Cleaning Wash	Cleaning of Laboratory Tools					$375
	Tools and Supplies	Muffle Furnace Accessories	Safety in handling crucibles to/from balance.					$55
	Equipment	Balance	Necessary for organic matter determination determination					$200
	Equipment	Microbalance	Necessary scale fordetermination carbon accumulation rate.					$540

	Tools and Supplies	Balance Weights	Balance Calibration					$164
	Equipment	Acid Storage Carbinet	Safe repository of acids in the lab.					$165
	Equipment	Biohazard Waste Bin	Trash for lab contaminated items.					$60
	Equipment	Furniture	Lab Tables, Stools, Whiteboard, Storage Racks					$1,943
	Equipment	Cooler	Storage of Lake Sediment Samples					$1,866
	Tools and Supplies	Pippettes	Controlled dispensing of chemicals.					$102
	Tools and Supplies	Sample Tubes	For agitation and synthesis of vegetation and organic matter analysis.					$235
	Tools and Supplies	Microscopy Slide Preparation	Slides and cover slips					$19
	Tools and Supplies	Sample Tube Storage	Racks for holding sample tubes awaiting analysis and storage.					$112
	Equipment	Field Equipment for Core Retrival	From Water Access to Core Site					$6,690
	Equipment	Onshore Transport and Core Extrusion	Safe transportation of core retrieval, extrusion, and extruded materials					$4,742
	Equipment	Microtuble Centrifuge	Separation for vegetation analysis					$57
	Equipment	Lab Drying Racks	To dry glassware and vessels used in equipment.					$89
	Tools and Supplies	Pb-210 Dating	Chronology of three cores done by St. Croix Watershed Research Station					$7,200
	Equipment	Agitation of Samples	Mixing and sieving of sediment for analysis.					$329
	Tools and Supplies	Sediment Treatment for Vegetation Analysis	Sediment must go through Acid Treatment and Defloculation, Acetolysis Treatment, SPT or HF Treatment, and Screening and Bleaching before slide mounting for microscopy.					$1,049
	Tools and Supplies	Lab Indispensables	Essential lab supplies and consumables.					$227
	Tools and Supplies	Lab and Field Safety	Field and laboratory emergency tools and Personal Protective Equipment (PPE)					$688
	Equipment	Sample Preperation	Sediment sample preparation using various distribution and collection containers.					$190
							Sub Total	**$37,654**

Capital Equipment								
		Rent	Space to conduct Lab Analysis	X				$28,880
							Sub Total	**$28,880**
Acquisitions and Stewardship								
							Sub Total	**-**
Travel In Minnesota								
	Miles/ Meals/ Lodging	1 Trip to Three Lakes representing each of the biomes of MN for 2 people. 714 miles total @ $0.725 POV with $127/day per diem.	Collect three gravity sediment cores.					$1,841
							Sub Total	**$1,841**
Travel Outside Minnesota								
							Sub Total	**-**
Printing and Publication								
	Publication	Open Access Peer-reviewed publication fee	fee to submit peer-reviewed article					$1,625
							Sub Total	**$1,625**
Other Expenses								
							Sub Total	**-**
							Grand Total	**$148,000**

Classified Staff or Generally Ineligible Expenses

Category/Name	Subcategory or Type	Description	Justification Ineligible Expense or Classified Staff Request
Capital Equipment		Rent	Space needed **Additional Explanation :** 1 year rental on space with water available.

Non ENRTF Funds

Category	Specific Source	Use	Status	Amount
State				
			State Sub Total	**-**
Non-State				
In-Kind	Personal of Chief Scientist of Creative Scientific	Binocular Microscope with computer for imaging	Secured	$1,790
			Non State Sub Total	**$1,790**
			Funds Total	**$1,790**

Total Project Cost: $149,790

This amount accurately reflects total project cost?

Yes

Attachments

Required Attachments

Visual Component

File: 84948334-468.pdf

Alternate Text for Visual Component

Past Field Work...

Financial Capacity

Title	File
Financial Capacity Note	5f86ebfe-54c.pdf

Supplemental Attachments

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

Title	File
Rodengen et al., 2025	de7af880-c14.pdf
Dietz et al., 2015	df51ca0e-97f.pdf
Pb-210 Dating Quote	876ab29a-1c5.pdf
Tools and Supplies Budget Supplement	b72f6c74-9d8.xlsx
Equipment Budget Supplement	4d4e7421-695.xlsx
Letter of Authorization for Proposal	b9e5492a-dc3.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 Commissioner's Plan 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:

Dr. Thomas Rodengen of Creative Scientific LLC

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