Environment and Natural Resources Trust Fund

2022 Request for Proposal

General Information

Proposal ID: 2022-258

Proposal Title: Stream Ecosystems: Are Restorative Efforts Effective?

Project Manager Information

Name: Michael Delong

Organization: Minnesota State Colleges and Universities - Winona State University

Office Telephone: (507) 457-5484

Email: mdelong@winona.edu

Project Basic Information

Project Summary: Assess stream habitat improvement projects. Using various catchment features (geomorphology, habitat conditions, present biological communities), we will be able to describe a successful restoration project.

Funds Requested: $533,000

Proposed Project Completion: December 31 2025

LCCMR Funding Category: Methods to Protect, Restore, and Enhance Land, Water, and Habitat (F)

Project Location

What is the best scale for describing where your work will take place?
> Region(s): SE

What is the best scale to describe the area impacted by your work?
> Region(s): SE

When will the work impact occur?
> During the Project

Narrative

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

Since 2008, more than US$18 million have been allocated to fund Habitat Improvement (HI) projects for Minnesota Trout Unlimited (MNTU) and Trout Unlimited Driftless Area Restoration Effort (TUDARE) that have rehabilitated coldwater trout streams within the Driftless region of SE Minnesota (SE MN). Funding from multiple sources has made it possible to implement projects, with specific designs, to target streams that have experienced severe disturbances. Due to catchment dynamics and local stream conditions, one HI project design typically cannot be applied to another catchment, making each project unique, challenging, and expensive. To overcome project challenges (i.e., "cookie-cutter" approach), assessments of HI project success need to be made which will (1) aid in selecting at-risk or imperiled streams for improvement efforts; (2) decrease the time spent selecting stream site restorations; (3) save important dollars for direct use on HI project implementation; and (4) increase the number of streams that can be restored.

What is your proposed solution to the problem or opportunity discussed above? i.e. What are you seeking funding to do? You will be asked to expand on this in Activities and Milestones.

We propose to develop a model to predict how successful future HI projects will be. We will define and use resilience as a tool to measure "successful" HI project sites. Projects that span the Driftless Region (DR) in SE MN, will be used as our sites of interest with the following basic criteria: HI projects using a variety of project engineering techniques (design type), in different geomorphological conditions, and have addressed fish and or benthic macroinvertebrate habitat quality. Developing a robust dataset across the DR, SE MN, from varying types of catchments, will allow a comprehensive, science-based approached, describing HI project success.

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?

1. Identify external constraints (e.g., local geomorphic controls, stream size, riparian zone conditions) that most influence stream habitat improvement project success.
2. Use information on external constraints to help stream restoration organizations prioritize sites for stream habitat work (i.e., assess success of future projects via modeling) and conservation.
3. Identify which habitat designs are most resilient to disturbances based on geomorphic and habitat features.
4. Develop a predictive model which can be widely utilized across varying catchments for managers, state agencies, and private conservation organizations to restore critical habitat.

Activities and Milestones

Activity 1: Identify stream sites, train individuals for project support, collect data for HI project site features, and develop a predictive model.

Activity Budget: $272,030

Activity Description:

We propose to identify stream HI project sites across SE MN, and compile pre- (where available) and post-project implementation data at each site for more than 40 sites. Data collected will include: (1) the date of project completion; (2) type of habitat design used; (3) external (i.e., non-project manipulated) environmental variables, such as upstream or downstream catchment area and land use, mean stream width, riparian zone conditions, biological sampling (fish and inverts, Control/Impact Design); (4) availability of post-project data that was manipulated such as sinuosity, stream slope, channel entrenchment and floodplain width; and (5) develop a model which gives a predicted outcome derived from local and catchment features. Train and develop a graduate student and an intern, to aid in field and lab work (i.e., data collection and biological sampling) which will equip them for stream sampling and data analysis. In order to develop and execute an effective project design, we will need to gather essential materials for stream sampling and data analysis for duration of the project(s).

Activity Milestones:

Description	Completion Date
Graduate student and intern development and training	July 31 2022
Equipment acquisition	July 31 2022
Identify stream habitat project sites and compile existing data	December 31 2022
Measure post-project geomorphic conditions	December 31 2023
Develop predictive models	June 30 2024

Activity 2: Analyze data, define and describe resilience, and define and determine level of HI project success.

Activity Budget: $260,970

Activity Description:

The Driftless region economy for SE MN brings in US$4.6 billion from trout angling. With more than 17,000 miles of trout streams, there is high demand for stream improvements in areas negatively impacted from disturbances. To assess the effectiveness of HI projects, we will assess at the catchment scale, assess habitat (instream and riparian), address and define resiliency as it relates to present biological communities (i.e., trout and EPT taxa), assess benthic macroinvertebrates using a food web approach, and geomorphology of the catchment. Assessments will be conducted in 2022, 2023, 2024, and 2025. Resiliency will be defined using robust assessments of trout, other fish populations, and invertebrate sampling by assessing pre-post-project implementation analysis and following disturbances. Analysis of all components of the project will aid in defining and describing what a typical "successful" HI project has achieved. Dissemination of findings will be presented each year at various research conferences such as: The Mississippi River Research Consortium, American Fisheries Society Minnesota Chapter Annual meeting, and/or the Annual Driftless Symposium.

Activity Milestones:

Description	Completion Date
Analyze data and report findings	June 30 2025
Define and describe resilience and HI project success	June 30 2025
Disseminate findings and publications	June 30 2025

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Martin Thoms	University of New England, Armidale, Australia	Will aid in overall project design management, assist and train in data analysis and geospatial mapping, and provide support in research dissemination and publications.	Yes
Douglas Dieterman	Minnesota Deparmtent of Natural Resources	will work with us to select appropriate sites for assessment, provide in-field cross-training on sampling methods to ensure comparability of data and integrate our data with contributor Dieterman's on going project for additional analysis	No
William Varela	Winona State University	Will design, implement, and coordinate all aspects of this project under the supervision of PI Michael Delong and Co-Contributor Martin Thoms. Will supervise a graduate student (Master of Science) and two undergraduate students who will complete a senior research report.	Yes

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 be funded?

Our results will provide habitat managers a valuable resource in time and monetary management. Our predictive model developed from all features derived from pre- and post-HI data, will allow wide use, in various catchment types, which will allow for targeted decision making for stream restoration. Results of this project will be disseminated to stream habitat managers in state agencies such as DNR and private conservation partners such as Minnesota Trout Unlimited and Trout Unlimited's Driftless Area Restoration Effort. Results will help stream habitat managers identify project sites and designs that have the highest probability of successfully achieving desired outcomes.

Project Manager and Organization Qualifications

Project Manager Name: Michael Delong

Job Title: Professor and Director

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

Michael Delong is Professor of Biology and Director of Large River Studies Center (LRSC) and has been at Winona State University since 1992. His active research program has focused on rivers and streams in the Southern, Northwestern, and Midwest of the U.S. for over 30 years. He has experience in the management of research projects, both large and small, through state (MNDNR, WDNR, WSU), federal (National Science Foundation, U.S. Environmental Protection Agency, U.S. Army Corps of Engineers, U.S. Geological Survey) and international funding. Prof. Delong takes an interdisciplinary approach bringing together hydrology, geomorphology, and ecology to address river science and rive management issues. Studies and publications through an interdisciplinary approach have determined how either geomorphology and/or hydrology shape community composition of fish and invertebrate communities in riverine habitats and their responsiveness to restoration. His pioneering research on river food webs also addressed the interplay between geomorphology and hydrology on food web dynamics using stable isotope ratios for both short-term field studies and long-term studies. He has directed over 150 undergrad research students through investigations of streams and rivers and supervised nine M.S. and Ph.D. students, and has published 39 peer-reviewed research papers and book chapters, all of which address the ecological form and function of streams and rivers. Professor Martin Thoms from the University of New England will assist Prof Delong. Prof. Thoms has published over 300 scientific manuscripts, had successful research projects worth >$50 million and supervised 75 Ph.D. students. Profs Delong and Thoms have an

enviable collaborative research record that address human-caused disturbances in rivers and the impact of disturbance and restoration activities on river resilience over the past 15 years.

Organization: Minnesota State Colleges and Universities - Winona State University

Organization Description:
Winona State University is a predominantly undergraduate institution in southeast Minnesota.

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	$ Amount
Personnel								
Primary Investigator		Supervising personnel, managing budget, other duties as project manger			18%	0.32		$40,712
PhD candidate		design, implement, and coordinate all aspects of this project under the supervision			40%	4		$262,546
Ecology Intern		conduct field and laboratory work, collect data			7.65%	0.75		$19,200
Ecology intern		conduct field and laboratory work, collect data			7.65%	0.75		$19,200
Master of Science graduate student		Geospatial analysis of river networks and habitat restoration projects, assist in field work			1%	1		$40,000
							Sub Total	**$381,658**
Contracts and Services								
Stable Isotope Laboratory	Professional or Technical Service Contract	Will process samples of invertebrates and fish and determine stable isotope ratios and provide data that will be used in analyzing food webs.				1		$89,250
							Sub Total	**$89,250**
Equipment, Tools, and Supplies								
	Tools and Supplies	ERDAS Software (4 years)	program creates geospatial maps of sites used in study					$8,000
	Tools and Supplies	HP laptop computer	needed for ERDAS analyses					$2,000
	Tools and Supplies	field equipment	used for collection of invertebrates and fish					$941
	Tools and Supplies	waders, rubber gloves, other field supplies	protection from electrofisher, capture and collection specimens					$1,800
	Equipment	Smith Root Electrofisher LR-24, 24-volt lithium batteries (2)	for collection and return of fish					$9,295

							Sub Total	$22,036
Capital Expenditures								
							Sub Total	-
Acquisitions and Stewardship								
							Sub Total	-
Travel In Minnesota								
	Conference Registration Miles/ Meals/ Lodging	1 trip, within 200 miles, 4 people, conference fee	give presentations and particpate in a relevant scientific conference					$2,400
	Miles/ Meals/ Lodging	50 trips, 7,200 miles, 4 people	Travel to stream sites approx. 120 mi/site x 60 sites = 7,200 mi x $0.49/mi =$ 3,528 Meals $25 x 60 = $1,500 Lodging ~ 40 overnight stays = $4,000					$18,056
							Sub Total	$20,456
Travel Outside Minnesota								
							Sub Total	-
Printing and Publication								
	Publication	publishing research in peer-reviewed journals	purpose of publications is to expose scientists and managers new information on habitat assessment/improvement					$9,600
							Sub Total	$9,600
Other Expenses								
		Direct necessary support for IT services, WSU Biology department services, equipment repairs or replacement parts and other fees.	Other fees may include registration fees for out of state conferences, student fees etc.					$10,000

							Sub Total	$10,000
							Grand Total	$533,000

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				
In-Kind	Minnesota DNR Fisheries Section contributed effort	Doug Dieterman (Research Scientist 2) will work with us to select appropriate sites for assessment, provide in-field cross-training on sampling methods to ensure comparability of data and integrate our data with contributor Dieterman's (MNDNR) on going project for additional analysis.	Secured	$9,000
			State Sub Total	**$9,000**
Non-State				
In-Kind	University of New England Department of Geography and Planning contributed effort	Professor Martin Thoms will aid in overall project design management, assist and train in data analysis and geospatial mapping, and provide support in research dissemination and publications. PhD Candidate William Varela will design, implement, and coordinate all aspects of this project under the supervision of PI Michael Delong and Co-Contributor Martin Thoms.	Secured	$229,000
			Non State Sub Total	**$229,000**
			Funds Total	**$238,000**

Attachments

Required Attachments

Visual Component

File: 494d1a17-a31.pdf

Alternate Text for Visual Component

The Driftless Area of southeastern Minnesota....

Optional Attachments

Support Letter or Other

Title	File
Trout Unlimited letter of support	ecbaf188-906.pdf
William Varella letter of support	8ee80c00-b6b.docx
MNDNR Letter Support WSU	e1059e1d-240.pdf

Administrative Use

Does your project include restoration or acquisition of land rights?

No

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, Minnesota State Colleges and Universities - Winona State University

Figure 1. Map of the Driftless Area across four states. Minnesota Driftless area in the upper left quadrant is where this project will be executed. Map courtesy of Minneapolis/St. Paul travel and visitor guide.