

**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. Ineli gible** | **% Bene fits** | **# FTE** | **Class ified 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](https://lccmrprojectmgmt.leg.mn/media/map/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](https://lccmrprojectmgmt.leg.mn/media/attachments/ecbaf188-906.pdf) |
| William Varella letter of support | [8ee80c00-b6b.docx](https://lccmrprojectmgmt.leg.mn/media/attachments/8ee80c00-b6b.docx) |
| MNDNR Letter Support WSU | [e1059e1d-240.pdf](https://lccmrprojectmgmt.leg.mn/media/attachments/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