



# Environment and Natural Resources Trust Fund

## 2021 Request for Proposal

### General Information

**Proposal ID:** 2021-091

**Proposal Title:** Long-Term Efficacy Of Invasive Removal In Floodplain Forests

### Project Manager Information

**Name:** Mike Anderson

**Organization:** Macalester College

**Office Telephone:** (651) 696-6230

**Email:** andersonm@macalester.edu

### Project Basic Information

**Project Summary:** This long-term scientific study will provide new, much-needed information for land managers focused on protecting Minnesota's invaluable floodplain forests from threats posed by overabundant deer, invasive shrubs and earthworms.

**Funds Requested:** \$25,000

**Proposed Project Completion:** 2021-09-30

**LCCMR Funding Category:** Small Projects (H)

**Secondary Category:** Aquatic and Terrestrial Invasive Species (D)

### Project Location

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

Region(s): Metro

**What is the best scale to describe the area impacted by your work?**

Statewide

**When will the work impact occur?**

In the Future

## Narrative

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

Floodplain forests – forests that are flooded for a portion of every year – provide many services that Minnesotans value along the rivers of our home state. The roots of trees and shrubs absorb pollutants from river water and bind soil, helping control flooding and prevent erosion. Their dense crowns evaporate excess water, and provide critical habitat and protection to resident and migrating bird species.

Floodplain forests also face multiple threats. Competition from invasive shrubs prevents establishment of the seedlings that provide the next generation of forest canopy. Overabundant deer eat many of the seedlings that escape such competition. And invasive earthworms create soil conditions that favor the invasive shrubs.

Effective ecosystem management requires understanding not only what threats exist, but also how they interact with each other. While removal of invasive shrubs, for example, may alleviate competition on native seedlings, it may also provide easier access for deer. Still, shrub removal may decrease earthworm populations, providing more nutrients for native seedlings. The balance of such interacting threats can differ in different ecosystems, so it is important that land managers have information specific to ecosystems they are trying to protect. Such information is not yet available to floodplain forest managers in Minnesota.

### **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 a scientific study of interactions between invasive shrubs, deer, and earthworms in a floodplain forest along the Mississippi River at Macalester College's "Ordway" Field Station. Our conservation partner – Friends of the Mississippi River (FMR) – will be removing invasive shrubs in 30 acres of Ordway's floodplain forest in 2021. Our proposal adds a scientific component to this restoration that will provide valuable information to floodplain managers across the state.

Removing invasive species from an area provides scientific opportunities to unambiguously measure their effects, and the effectiveness of their removal. This study will take advantage of these opportunities in two ways: 1) by measuring the effects of deer and invasive shrubs on survival and growth of tree seedlings and herbs, and 2) by measuring the effect of invasive shrub removal on invasive earthworm populations. Ordway is an excellent location for such a study, as it contains one of the most common floodplain forest types in Minnesota, has an overabundance of deer, and has a large earthworm population. The shrub species we are studying – buckthorn and honeysuckle – are also listed among the University of Minnesota's Invasive Terrestrial Plants and Pests Center's 15 top priority species.

### **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 study will investigate important threats to Minnesota's floodplain forests, and provide information relevant to their effective management. We will address:

1. The individual effects of deer browsing and non-native invasive shrubs on native plants.
2. How the effects of deer browsing and non-native invasive shrubs depend on each other.
3. How deer and shrubs affect non-native invasive earthworm populations.
4. Whether native plant communities naturally recover when non-native invasive shrubs and/or deer are removed.
5. How long any positive effects of shrub and/or deer removal are likely to last.

## Activities and Milestones

### Activity 1: Experiment development

**Activity Budget:** \$23,000

**Activity Description:**

Like any field experiment, this study will require careful design, which begins with selection of appropriate sites. To provide replication, several suitable sites at least 10 meters x 10 meters will be identified within the 30-acre restoration area. Site selection will be based on presence and evenness of distribution of invasive shrubs, earthworms and deer activity across the site. Selection will be conducted by both Ordway and FMR personnel, in order to provide as wide a range of expertise as possible. Once sites are chosen, experimental plots (2 meters x 2 meters) will be situated within them in such a way that the plots are as similar as possible in elevation, soil type, invasive shrub cover, and native vegetation.

Once plots have been established within each site, experimental treatments will be applied. Invasive shrubs will be removed from half of each chosen site. Then, in half of each half-site (invasives removed/not removed) one 3 meter x 3 meter deer 'exclosure' fence will be built to prevent deer access. Exclosure construction will be conducted by Ordway personnel, who have experience in this activity.

**Activity Milestones:**

Description	Completion Date
Construction of deer exclosure fences	2021-07-31
Selection of appropriate field sites and planning of experimental treatments	2021-07-31
Removal of invasive shrubs from field plots	2021-09-30

### Activity 2: Baseline data collection

**Activity Budget:** \$2,000

**Activity Description:**

In year 1, when the study is established, data will be collected by Ordway personnel after sites are selected, but before invasive shrubs are removed. These will represent the 'baseline' state of each plot prior to the experiment.

Vegetation, light, and earthworm populations will be measured at baseline, then once per year in June every year thereafter. All measurements will follow protocols that have been used successfully by Ordway personnel for several years. Vegetation measures will focus on the number and size of native tree seedling species, but will also include the most common herb species, and several diversity measures of the whole understory plant community. Light will be measured as percent of sky visible in canopy photographs taken at 1 meter above the ground. Earthworm populations will be measured using a standard liquid mustard extraction method.

LCCMR funds will be used for year 1 data collection activities, but long-term data collection will be funded through Ordway's regular budget.

**Activity Milestones:**

Description	Completion Date
Collection of baseline data: vegetation, light, earthworm populations	2021-07-31



## Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Jerald Dosch	Macalester College	Co-PI for the project	Yes
Alex Roth	Friends of the Mississippi River	Conducting restoration activities that the proposed project seeks to measure the effects of.	No
Karen Schik	Friends of the Mississippi River	Conducting restoration activities that the proposed project seeks to measure the effects of.	No

## 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?**

While we propose to use LCCMR funding to cover the costs of establishing this study, the study will continue long-term. Initial costs include materials for building deer exclosures, and salary for hiring extra student workers and covering extra faculty and staff time commitments during the first year’s site selection, data collection, and exclosure construction activities. Once established, long-term data collection will be performed during Ordway’s regular research activities and fall comfortably within our budget. Year 1 and longer-term data will be analyzed during Ordway’s regular research activities. Results will be written and submitted for publication in the conservation literature.

## Project Manager and Organization Qualifications

**Project Manager Name:** Mike Anderson

**Job Title:** Associate Director, Ordway Field Station

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

The project manager, Mike Anderson, has extensive training and experience in conducting ecological field studies, as well as a unique knowledge of the study site. He received his PhD from University of Alaska, Fairbanks in 2011, where he trained in field ecology. He has worked and lived at Macalester College’s Katharine Ordway Natural History Study Area (“Ordway Field Station”) since 2004, where he currently serves as the Associate Director and Resident Naturalist. In this position, he has conducted – individually and in collaboration with other researchers – over two dozen scientific studies, mostly focused on the effects of invasive species such as common buckthorn and garlic mustard. This work has resulted in the training of more than 50 undergraduate students and several publications in peer-reviewed journals including *Ecosphere* (2019), the *Journal of Vegetation Studies* (2015), and *Biological Invasions* (2015). The proposed study is similar in field design and data collection methods to many previous studies that Dr. Anderson has conducted or helped to conduct at Ordway. Additionally, living at the field station for 16 years has provided Dr. Anderson with a uniquely comprehensive knowledge of the study site, which will aid in selection of appropriate field locations and help avoid hazards such as flood damage to study plots. Further, his proximity to the location of the proposed study will facilitate day-to-day monitoring and maintenance activities.

**Organization:** Macalester College

**Organization Description:**

Macalester College is a highly selective liberal arts college in St. Paul, Minnesota. “Macalester is committed to being a preeminent liberal arts college with an educational program known for its high standards for scholarship and its special emphasis on internationalism, multiculturalism, and service to society” (Macalester College Mission). A 10:1

student/faculty ratio ensures that Macalester's 2,098 students receive intensive instruction both in and out of the classroom. U.S. students of color comprise 28% of the Macalester student body. Consistent with broader trends in higher education, the majority of our students are female (57% in Fall 2019). In addition, 15% of Macalester students are international, representing 74 countries by citizenship. To ensure that students from all backgrounds can attend, Macalester meets the full financial need of admitted students. Two-thirds of our students receive need-based financial aid, with an average award of \$49,047 for full-time students in 2019.

## Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	\$ Amount
<b>Personnel</b>								
Mike Anderson		Project Manager			9%	0.08		\$565
Jerald Dosch		Supervisor/Co-PI			9%	0.08		\$9,215
Student Researcher		Assist with and learn research activities			9%	0.19		\$6,050
Student Researcher		Assist with and learn research activities			9%	0.19		\$6,050
							<b>Sub Total</b>	<b>\$21,880</b>
<b>Contracts and Services</b>								
							<b>Sub Total</b>	-
<b>Equipment, Tools, and Supplies</b>								
	Equipment	Fenceposts for 12x 40' perimeter enclosures	Remove deer access from experimental plots					\$1,100
	Equipment	500 feet of heavy wire fencing	Removal of deer access from experimental plots					\$1,300
	Equipment	Heavy-duty zipties, 2000	Connectors for fencing; Remove deer access from experimental plots					\$200
	Equipment	240' of 1" PVC piping	Permanently mark corners of measurement plots					\$100
	Tools and Supplies	5 pounds of organic mustard powder	Extract earthworms from soil for measuring abundance					\$100
							<b>Sub Total</b>	<b>\$2,800</b>
<b>Capital Expenditures</b>								
							<b>Sub Total</b>	-
<b>Acquisitions and Stewardship</b>								

							<b>Sub Total</b>	-
<b>Travel In Minnesota</b>								
	Other	Transport boats to field site	Move 2 boats from storage to field site					\$150
	Other	Fuel and maintenance of 2 boats, 30 1-mile round trips	Transport materials and personnel to field sites					\$170
							<b>Sub Total</b>	<b>\$320</b>
<b>Travel Outside Minnesota</b>								
							<b>Sub Total</b>	-
<b>Printing and Publication</b>								
							<b>Sub Total</b>	-
<b>Other Expenses</b>								
							<b>Sub Total</b>	-
							<b>Grand Total</b>	<b>\$25,000</b>

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
<b>State</b>				
			<b>State Sub Total</b>	-
<b>Non-State</b>				
			<b>Non State Sub Total</b>	-
			<b>Funds Total</b>	-

## Attachments

### Required Attachments

#### *Visual Component*

File: [22fa5596-837.docx](#)

#### *Alternate Text for Visual Component*

Satellite photo of the project area (circled in red), which encompasses a >1 mile length of Mississippi River floodplain forest. Note that the most ready access to the project area from the field station building (address marker) involves boat transportation across River Lake.

#### *Financial Capacity*

File: [f05b93b6-c32.pdf](#)

### Optional Attachments

#### *Support Letter or Other*

Title	File
Letter of support from Friends of the Mississippi River	<a href="#">126cd07a-0a0.pdf</a>

## Administrative Use

**Does your project include restoration or acquisition of land rights?**

No

**Does your project have patent, royalties, or revenue potential?**

No

**Does your project include research?**

Yes

**Does the organization have a fiscal agent for this project?**

No

