

Environment and Natural Resources Trust Fund

2026 Request for Proposal

General Information

Proposal ID: 2026-416

Proposal Title: Minnesota Minnow Mania: Diversity Trends and Reproductive Strategies

Project Manager Information

Name: Kassandra Ford Organization: U of MN - College of Food, Agricultural and Natural Resource Sciences Office Telephone: (920) 366-2243 Email: ford0411@umn.edu

Project Basic Information

Project Summary: Our project will examine environmental factors that influence the reproductive success and trends in important minnow and shiner species found in Minnesota.

ENRTF Funds Requested: \$299,000

Proposed Project Completion: June 30, 2028

LCCMR Funding Category: Small Projects (G) Secondary Category: Fish and Wildlife (D)

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.

Native minnows and shiners (Leuciscidae species often referred to as "bait fishes" by those who fish in Minnesota), are an integral part of aquatic ecosystems. State agencies (including the MNDNR and MPCA) use Indices of Biological Integrity to assess watershed health and water quality. Part of this work captures fish biodiversity data that is further validated by the Bell Museum. This analysis is based on a multitude of factors, including overall species richness and the sensitivity of fish species (cold-water preferences, intolerant of water quality changes, diet, etc.). While we have longterm data about species distribution across the state over time, we lack a comprehensive analysis focused primarily on leuciscid species, the important "middle" trophic level of aquatic ecosystems. Additionally, we are missing key information about the ecology, evolution, and morphology of these leuciscid species, diminishing our understanding of downstream effects of changing watersheds. We anticipate water quality changes to impact aquatic ecosystems in Minnesota, but have little idea how those changes could affect populations of fishes at mid- to lower-trophic levels. Drastic changes in water quality could impact the breeding of key minnow and shiner species, which directly support the game and indicator species in the state.

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.

During our first field season, we will obtain live fish for experimental studies on reproductive success. We will establish breeding colonies of fathead minnows, common shiners, and spotfin shiners to examine the effects of water quality changes on reproductive success and secondary sexual characteristics. Tubercles, keratinized structures developed on breeding males, could be crucial indicators of water quality, organismal health, and breeding capabilities. We will test various water quality factors on these populations to identify key environmental factors that influence breeding success. We will then use modeling approaches to analyze already-existing fish survey and environmental data generated from the MNDNR and MPCA to assess biodiversity and distribution trends over time and identify at-risk habitats based on expected water quality changes. We also hope to obtain additional information about leuciscid populations from local landowners and fishers who catch their own bait, working with nature-related non-profits, like Native Fish 4 Tomorrow. Our goal is to create citizen science projects aimed to monitor native fishes and monitor habitats. This combination of fieldwork, labwork, and modeling can be used to generate and produce models that can predict habitats where leuciscid species will continue to be successful, even after water quality changes.

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?

We aim to analyze biodiversity and distribution trends, as well as gain important information about the ecology, evolution, and morphology of our native minnow and shiner populations. These fishes are critical to supporting our game species in Minnesota and strengthening fisheries and recreation. This work will further connect state agencies with the University of Minnesota and the Bell Museum, increase natural history collections and their usefulness, and provide opportunities for outreach and collaboration with the general public. This will improve our understanding of the aquatic ecosystems found here in Minnesota and beyond.

Activities and Milestones

Activity 1: Summer fieldwork for reproductive ecology data

Activity Budget: \$113,000

Activity Description:

Fieldwork during the first two summers of the project (2026-2027) will include sampling across regions of Minnesota to identify breeding habitats for leuciscid species. Once identified, we will obtain ecological data (e.g., fish species richness, species tolerance, vegetation diversity, etc.) and environmental data (e.g., temperature, conductivity, pH, and dissolved oxygen). These data will allow us to assess similarities and differences between breeding grounds for different leuciscid species, along with species preferences for environmental factors. We will also collect live fishes and bring them back to the University of Minnesota for Activity 2. We expect to see varying levels of leuciscid biodiversity across sites, based on human development and water quality. Fieldwork will take place primarily between late May and early August, dependent on funding periods. We already have fieldwork and water quality sampling equipment. Part of this work may also include collaboration with MNDNR and MPCA sampling teams.

Activity Milestones:

Description	Approximate Completion Date
Summer Fieldwork (2 months in 2026, 3 months in 2027)	August 31, 2027
Collection of Live Fishes	August 31, 2027

Activity 2: Evolution of Reproductive Strategies in Minnows/Shiners

Activity Budget: \$177,000

Activity Description:

Lab work will focus on breeding colonies in aquaria at the University of Minnesota. In collaboration with Solomon David, we will set up several aquaria of both fathead minnows and common shiners. These colonies will allow us to test for patterns in reproductive ecology and secondary sexual characteristics. We aim to examine the effects of water quality changes, temperature, and light on the reproduction and the development of tubercles on breeding males. Further information gathered will include life history characteristics, tubercule distribution, fitness associations with tubercle development, along with the environmental signal that promotes tubercle development. Our goals with these studies will be to examine the connection between secondary sexual characteristics and water quality, which could tell us crucial information about what species are most susceptible to water quality issues. We will compare results found in fathead minnows (a documented tolerant species) to the common shiner, a more intolerant species that is still commonly found across Minnesota.

Activity Milestones:

Description	Approximate Completion Date
Establish Breeding Colonies	August 31, 2027
Environmental Factors Experiments	June 30, 2028
Morphological Examinations	June 30, 2028

Activity 3: Modeling leuciscid biodiversity from Reproductive Strategies & Minnesota IBI Data Activity Budget: \$9,000

Activity Description:

This activity will expand on the already existing biodiversity and distribution data obtained from state agencies during their annual sampling trips. We will first analyze this data to identify priority watersheds - including ones that have high water quality, along with those that are suffering from lower water quality. We will leverage the information we gained from Activities 1 and 2 (breeding localities and environmental variables associated with reproductive success) to determine which watersheds are most at risk for additional biodiversity loss. This data will then be distributed to the general public through outreach events, discussions with fishers, and through a citizen-science project to obtain additional data. We aim to connect with local landowners and fishers to gain information about bait fish populations, as well as continually monitoring known breeding grounds. We hope to identify crucial areas of restoration and conservation to better support game and non-game fishes alike.

Activity Milestones:

Description	Approximate		
	Completion Date		
Identify Priority Breeding Grounds	June 30, 2027		
Model Changes Predicted for Priority Breeding Grounds	December 31, 2027		
Determine At-Risk Watersheds and Prioritize with State Agencies	June 30, 2028		
Outreach to General Public	June 30, 2028		
Communicate Findings with Public and Scientific Community	June 30, 2028		

Project Partners and Collaborators

Name	Organization	Role	Receiving
			Funds
Dr. Solomon	University of	Co-PI	Yes
David	Minnesota -		
	Twin Cities		
Tyler Winter	Native Fish 4	Outreach and Fishing Expert	Yes
	Tomorrow		
Jay Hatch	University of	Collaborator	No
	Minnesota -		
	Twin Cities		
Kim Laing	Minnesota	Collaborator	No
	Pollution		
	Control		
	Agency		

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?

After the duration of this grant period, the project will continue, solely through the continual analysis of biodiversity and distribution data. This will allow state agencies and the Convergence Lab to identify key habitats and ecosystems that require restoration or conservation efforts. Data generated from these projects will remain accessible to the public. We do not anticipate products to be developed from this work.

Project Manager and Organization Qualifications

Project Manager Name: Kassandra Ford

Job Title: Assistant Professor & Curator of Ichthyology and Malacology

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

The project manager is a tenure-track assistant professor and museum curator with the University of Minnesota - Twin Cities and the Bell Museum of Natural History. They are responsible for managing a large ichthyology collection, mentoring graduate students, and performing research at a high caliber. The manager has knowledge and experience with fieldwork identifications and active collaborations with state agencies.

Organization: U of MN - College of Food, Agricultural and Natural Resource Sciences

Organization Description:

University of Minnesota's Fisheries, Wildlife, & Conservation Biology Department is at the forefront of research about ecology, management, and biodiversity, with a focus on state habitats and organisms. FWCB aims to create solutions for biological conservation and management in a changing world through research, education, and collaboration. The Bell Museum of Natural History is the state's natural history museum and houses incredibly important biodiversity specimens from Minnesota. It provides opportunities for research, public engagement, and education at a statewide level. The Bell ignites and sustains curiosity for nature and the universe through programming, curation, and outreach.

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineli gible	% Bene fits	# FTE	Class ified Staff?	\$ Amount
Personnel								
Graduate Research Assistant		Graduate Assistant will perform summer fieldwork and lab work during the academic school year. This will include animal husbandry, experiments, data collection, and data analysis associated with the project. Approx. cost breakdown: FY27 =\$48000 (Stipend 23000 + Benefits 5300 + Tuition 19500), FY28=\$49000 (Stipend 24000 + Benefits 5500 + Tuition 20000)			23.2%	1		\$97,000
Faculty Summer Salary for Project Manager (KLF)		Summer fieldwork coordination and data collection. 1mo summer salary 2026, 3mo summer salary 2027.			36.6%	0.25		\$57,000
Faculty Summer Salary for Co- PI (SRD)		Summer fieldwork coordination and data collection. 1mo summer salary 2026, 2mo summer salary 2027.			36.6%	0.25		\$44,000
Lab Manager and Fieldwork Coordinator		Project technician and manager for animal husbandry and lab work.			32.3%	1		\$75,000
							Sub Total	\$273,000
Contracts and Services								
Tyler Winter, Native Fish 4 Tomorrow	Service Contract	Outreach coordinator and fieldwork expert				0.02		\$2,500
							Sub Total	\$2,500
Equipment, Tools, and Supplies								
	Equipment	Aquarium setup equipment	Aquarium tanks and relevant items will house breeding colonies of minnows					\$3,000

			and shiners for experiments and			
			observation			
	Equipment	Fieldwork Equipment	Nets, seines, and electro-shocker for			\$4,000
			fieldwork expeditions			
					Sub	\$7,000
					Total	
Capital						
Expenditures						
					Sub	-
					Total	
Acquisitions						
and						
Stewardship						
					Sub	-
					Total	
Travel In						
Minnesota						
	Conference	Minnesota AFS conference travel for 2 years with 3	Conference attendance to share and			\$4,000
	Registration	attendees. Mileage will be <200 miles. Lodging 2	disseminate research findings and			
	Miles/ Meals/	nights per individual. Minnesota AFS conference	further establish collaborations with			
	Lodging	travel for 2 years with 3 attendees. Mileage will be	state agencies and other universities.			
		375 miles @ \$0.70/mi. for each conference (\$525				
		total). Lodging 2 nights per individual @ 165/ng. (3				
		people x 2ngs x 2 conference =\$1,980 total)				
		Conference registration @ \$249 ea. (3people x 2				
		conference = \$1,494)				
	Miles/ Meals/	Fieldwork travel over 2 summers. Anticipate	Fieldwork sampling to obtain			\$10,000
	Lodging	sampling 8 total sites, 3-4 times per year across	environmental data for breeding			
		Minnesota. Travel for 3-4 people. Miles are	grounds and obtain live fishes for			
		\$0.70/mi. Lodging MN standard is \$165/ng. MN	experiments and observation.			
		standard meal per diem is \$51/1st & last day of				
		travel + \$68/ full travel day.				
					Sub	\$14,000
					Total	
Travel						
Outside						
Minnesota						
					Sub	-
					Total	
Printing and						
Publication						

	Printing	Informational Material for outreach events	We aim to disseminate research findings to the general public and through Native Fish 4 Tomorrow to			\$2,500
			importance of native fishes in			
			Minnesota			
					Sub	\$2,500
					Total	
Other						
Expenses						
					Sub	-
					Total	
					Grand	\$299,000
					Total	

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
State				
			State Sub	-
			Total	
Non-State				
			Non State	-
			Sub Total	
			Funds	-
			Total	

Total Project Cost: \$299,000

This amount accurately reflects total project cost?

Yes

Attachments

Required Attachments

Visual Component File: <u>aa5604d9-133.pdf</u>

Alternate Text for Visual Component

Minnesota Minnow Mania! Three components: Fieldwork (sampling across MN), Lab work (aquarium setups to test environmental factors affecting breeding of minnows and shiners), and Modeling (estimating habitats at risk after water quality changes). Affiliations and Partners are listed (UMN, Convergence Lab, GarLab, MNPCA, NF4T, Bell Museum)....

Supplemental Attachments

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

Title	File
Jay Hatch Support Letter	<u>c6f34679-8bf.pdf</u>
Board of Regents Approval Letter	<u>3a7c4586-a86.pdf</u>
Minnesota Pollution Control Agency Support Letter	2544db68-3d4.pdf
Native Fish For Tomorrow Support Letter	a4d93ab9-1c4.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?

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:

Solomon David (UMN), Patrick McDonald (UMN), Danielle Thomas (UMN)

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

Yes, I understand