

# **Environment and Natural Resources Trust Fund**

# 2026 Request for Proposal

## **General Information**

Proposal ID: 2026-560

Proposal Title: Conservation of the Mudpuppy, an Enigmatic Indicator Amphibian

# **Project Manager Information**

Name: Kenneth Kozak Organization: U of MN - College of Food, Agricultural and Natural Resource Sciences Office Telephone: (651) 492-0778 Email: kozak016@umn.edu

# **Project Basic Information**

**Project Summary:** Mudpuppy salamanders are important indicator species of aquatic ecosystem health. This research will assess the impact of historical drainage changes on the long-term persistence of this keystone aquatic species.

**ENRTF Funds Requested:** \$221,000

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.

The long-term health of Minnesota's aquatic ecosystems relies critically on conserving the underlying processes that sustain native species. Mudpuppy salamanders are ancient amphibians that are native to Minnesota, have deep historical associations with state's river drainages, and are indicators of high environmental quality. Yet, despite being widely distributed and common where they are encountered, anglers and naturalists have observed that this species has mysteriously disappeared from parts of its range in Minnesota. This makes them an ideal species to assess the relationships among drainage patterns (e.g. historical watersheds, dams) and key population process that sustain the genetic diversity and adaptive potential of populations, namely dispersal, gene flow, and population size.

# 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.

I the natural world, species are distributed along a dispersal continuum that ranges from geographic connection to geographic isolation. Illuminating this natural continuum of connection is foundational to assessing the health of local populations and for developing strategies that will conserve the process that generate and maintain the genetic diversity required for the continued persistence of species.

We propose to use a population-genomic approach to assess role of natural (watersheds) vs. anthropogenic drainage features (dams) on mudpuppy diversity and persistence. The results will provide valuable insights on the extent to which population dynamics and aquatic ecosystems have been disrupted across the state.

# 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?

The proposed research will examine the population genetic history and population structure of the Mudpuppy salamanders statewide. The mudpuppy is an indicator of aquatic ecosystem health. Accordingly, the results will provide important baseline data on how historical and man-made features associated with Minnesota's waterways impacts population-level processes that sustain biodiversity can be incorporated into conservation efforts.

# Activities and Milestones

# Activity 1: Graduate Assistant Recruitment, Mudpuppy Sample Collection

Activity Budget: \$87,000

#### **Activity Description:**

A graduate student will be recruited and trained to carry the activities over the two-year duration of the project.

Following recruitment, we will collect Mudpuppy DNA samples from focations in drainages where this species is known to occur and from reaches above and below dams within each drainage. Known locations will be targeted based on prior locations from which we have sampled, and queries from the Minnesota Biodiversity Atlas (https://bellatlas.umn.edu) and HerpMapper (https://herpmapper.org) databases. This sampling design will allow us to assess the role of natural (watersheds) vs anthropogenic barriers (dams) in shaping the long-term persistence of mudpuppy diversity and to provide an assessment of ecosystem quality.

#### **Activity Milestones:**

Description	Approximate Completion Date
Graduate student recruitment	August 31, 2026
Genetic sample collection	August 31, 2027

#### Activity 2: Genomic data collection and analysis

#### Activity Budget: \$130,000

#### **Activity Description:**

Tissue samples collected for genomic analysis during Activity 1 will be prepared genomic analysis. Lab activities will include DNA extraction, genomic library preparation, and the acquisition of next-generation, genome-wide, sequencing.

Following acquisition of data on genome-wide genetic variation, pair-end next-eneration sequence reads will be filtered for, aligned and assembled. Standard genomic statistical procedures will be used to estimate the geographic partitioning of genetic variation, migration rates across natural vs human-made barriers.

#### **Activity Milestones:**

Description	Approximate Completion Date
Genomic data collection	February 28, 2028
Genomic data analysis	April 30, 2028

#### Activity 3: Dissemination of results and exploration of conservation applications

#### Activity Budget: \$4,000

#### **Activity Description:**

Following genetic analysis, the results will be presented at regional and scientific meetings. Our findings and their conservation implication will also be shared with the MN DNR through their annual "Biodiversity Highlights Series"

#### **Activity Milestones:**

Description	Approximate
	Completion Date

# 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?

The proposed research and its results will be communicated to the public at the Minnesota State Fair and the Bell Museum. Research results will also be disseminated to the scientific community through journal publications and research presentations at regional and international meetings. Moreover, we will communicate our findings and explore avenues for incorporating them into conservation efforts at the annual "Biodiversity Hightlights Series" hosted by the MN DNR.

# Other ENRTF Appropriations Awarded in the Last Six Years

Name	Appropriation	Amount Awarded
Northward Expansion of Ecologically-Damaging Amphibians and Reptiles	M.L. 2023, , Chp. 60, Art. 2, Sec. 2, Subd. 06a	\$163,000

# Project Manager and Organization Qualifications

Project Manager Name: Kenneth Kozak

Job Title: Associate Professor and Curator

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

Research in the Kozak's lab is centered on understanding on how species spread, diversify, and accumulate across the landscape over time. To address these questions, my lab in the Department of Fisheries, Wildlife & Conservation Biology and Bell Museum collects and analyzes genetic and ecological data in a spatial framework. My most recent research focuses on identifying the evolutionary and ecological factors that limit the geographic ranges of narrowing-ranging amphibian species and predicting how these vulnerable species will respond to environmental change.

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	% Bene	# FTE	Class ified	\$ Amount
				gible	fits		Staff?	
Personnel								
Associate		Project supervision, data analysis, dissemination and			36.6%	0.34		\$47,000
Professor		publication of results (3 months summer salary)						
Graduate		Data collection and analysis; Grad student fringe is			23.2%	1		\$116,000
Research		23.3% plus tuition at \$23.08/hr for 4 semesters and						
Assistant (2		two summers without tuition. Total tuition						
years of		requested is \$36,000						
support)								
							Sub	\$163,000
							Total	
Contracts and Services								
UMN	Internal	Illumina next-generation sequencing.				-		\$30,000
Genomics	services or							
Center	fees							
	(uncommon)						ļ	
							Sub Total	\$30,000
Equipment, Tools, and Supplies								
••	Tools and	DNA Extraction Kits	Kits to extract DNA for samples for					\$6,000
	Supplies		sequencing					
	Tools and	Molecular lab supplies, general	Supplies for general molecular genetic					\$10,000
	Supplies		lab procedures (plastics, chemicals,					
			reagents)					
							Sub	\$16,000
							Total	
Capital Expenditures								
							Sub Total	-
Acquisitions							Total	
and Stewardship								
P							Sub	-
							Total	

Travel In Minnesota						
	Miles/ Meals/ Lodging	Approximately 4300 miles of travel at \$0.70 per mile.	To collect eDNA samples from MN waterways			\$3,000
	Miles/ Meals/ Lodging	GSA per diem (lodging + M&IE @ MN standard rate, 30 days @ \$155/day),	Costs for meals and lodging associated with travel to field sites to collect samples.			\$5,000
					Sub Total	\$8,000
Travel Outside Minnesota						
					Sub Total	-
Printing and Publication						
	Publication	Page charges to publish in open-access scientific journal	Dissemination of research results to scientific community			\$4,000
					Sub Total	\$4,000
Other Expenses						
					Sub Total	-
					Grand Total	\$221,000

# 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: \$221,000

This amount accurately reflects total project cost?

Yes

# Attachments

# **Required Attachments**

*Visual Component* File: <u>b4bd8154-e27.pdf</u>

#### Alternate Text for Visual Component

Sampling locations for which Mudpuppies have been documented and sampled for genetic analyses. Also uploaded under "Supplemental Attachments"....

#### Supplemental Attachments

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

Title	File
Map for the Minnesota River Basin, illustrating geographic	52dda117-dc9.pdf
sampling of Mudpuppy genetic samples in relation to dam	
locations.	
Sampling locations for which Mudpuppies have been	b8ed3bc5-82a.pdf
documented and sampled for genetic analyses.	
UMN Approval Letter	<u>e4305084-cdd.pdf</u>

## 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:

Jennifer Olson, University of Minnesota. Danielle Thomas, University of Minnesota

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