

## **Environment and Natural Resources Trust Fund**

## 2023 Request for Proposal

### **General Information**

Proposal ID: 2023-217

Proposal Title: Linking Breeding and Migratory Bird Populations in Minnesota

### **Project Manager Information**

Name: Emily Pavlovic Organization: Hawk Ridge Bird Observatory Office Telephone: (219) 877-5928 Email: pavlo043@d.umn.edu

### **Project Basic Information**

**Project Summary:** Understand seasonal movements, population connectivity, and contaminant exposure of Minnesota's breeding and migrating birds to inform long-term conservation efforts.

Funds Requested: \$199,000

Proposed Project Completion: June 30, 2026

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

Secondary Category: Foundational Natural Resource Data and Information (A)

## **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?

In the Future

## Narrative

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

Studying birds during migration is often easier than during other life stages because large numbers of birds concentrate in migratory paths (flyways). While monitoring bird populations during migration is useful, migratory birds depend on many locations during their full annual cycle. Events and hazards occurring anytime during a bird's life can have large impacts on avian populations. Therefore, linking migration with other geographical locations used by a species is essential for conservation and management.

Knowledge of breeding origin, migratory patterns, and nest-site fidelity of MN breeding birds are fundamental to the conservation of populations and individuals. In addition, breeding range and migratory patterns have the potential to shift due to changing human landscape usage and climate change; therefore, understanding the current ranges and migratory patterns of these species is essential for predicting future shifts in habitat use.

Birds are also bioindicators of ecosystem health due to their sensitivity to human-caused perturbations, widespread distributions, and trophic positions. If we can relate exposure to environmental contaminants with geography then we have a better chance of implementing effective conservation strategies. Because bird populations have experienced serious declines throughout North America, understanding their dispersal and migration strategies has important conservation implications.

## 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.

We will use a combination of telemetry and isotopic analysis to fill knowledge gaps about breeding and migratory populations of Minnesota bird species. We will conduct a comprehensive assessment for MN breeding bird species that are of conservation interest (e.g., Northern Goshawk, Northern Harrier, Canada Warbler). Specifically, our study will identify breeding origin, migratory patterns, and nest-site fidelity of MN breeding birds.

First, we will partner with bird banding stations across the state to collect feather samples to create a high-resolution, habitat-specific isotope map for the entire state. Second, during migration we will band birds and collect feathers for isotope analysis to identify regions and habitats used during the breeding season. In addition, we will deploy transmitters to validate isotope analysis and provide more resolution to migratory movements. Feathers from individuals with existing contaminant data will also be analyzed for stable isotopes. Together these data will allow us to quantify the relative importance of breeding habitats for focal species and identify geographical areas that have high risk for contaminant exposure. The proposed techniques will prioritize habitat restoration and mitigation efforts across the state and will serve as a model for methodology that can be used for continent-scale contaminant monitoring.

## 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 project will provide information for long-term monitoring and serve as a tool to help prioritize habitat restoration efforts for several understudied species of conservation concern including Northern Goshawk, Northern Harrier, and Canada Warbler. The proposed project will help identify breeding origins as well as breeding habitats for Minnesota birds while also evaluating areas of greatest risk of contaminant exposure. We will share outcomes with land managers, state and federal government agencies, and non-profit organizations working to conserve these species.

## **Activities and Milestones**

## Activity 1: Collect breeding bird feather samples to create a comprehensive isotope base map for Minnesota breeding birds and deploy transmitters.

#### Activity Budget: \$40,221

#### **Activity Description:**

We will coordinate with MAPS (Monitoring Avian Productivity and Survivorship) stations and breeding bird nest surveys across Minnesota to collect feather samples (n= 10 for each species/age/site) from juvenile and adult birds. Stable isotope analysis is a non-invasive technique that can be used to estimate geographic origin based on naturally occurring isotopic patterns in the environment. Feathers will be analyzed for stable isotopes and used to relate tissue isotope values to geographic locations. From these known isotope values we will create a base map for MN that will allow us to assign a breeding origin to birds banded during migration. We will also assess variation in isotope values between adult and juvenile individuals and between species. In addition, transmitters will be deployed on adult breeding birds to assess nest site fidelity as well as broad-scale movement patterns.

Outcome: Determine the relationship between isotope ratios in precipitation across Minnesota to isotope ratios in bird feathers and assess nest site fidelity.

#### **Activity Milestones:**

Description	Completion Date		
Coordinate with MAPS stations and breeding bird nest surveys to collect feather samples.	July 31, 2025		
Deploy transmitters on adult breeding birds to assess nest site fidelity and seasonal movement	July 31, 2025		
patterns.			
Stable isotope analysis of breeding season feather samples.	November 30, 2025		
Create an isotope base map using isotope values from breeding birds.	February 28, 2026		

## Activity 2: Collect feather samples and deploy transmitters on birds banded during migration to assess breeding locations and migratory connectivity.

#### Activity Budget: \$135,379

#### **Activity Description:**

We will collect feather samples for stable isotope analysis from birds during migration at Hawk Ridge. Birds will be assigned to a breeding origin based on isotope values and the base map created in Activity 1. Using the geographic assignment based on stable isotope analysis we will be able to quantify the proportion of migrants that are MN breeders. Transmitters will be deployed on adult individuals to confirm isotopic signatures and add resolution to isotope data.

Outcome: Quantify the importance of MN breeders to migratory populations and create migratory connectivity between breeding and migration locations.

#### **Activity Milestones:**

Description	Completion Date
Collect feather samples during migration at Hawk Ridge for stable isotope analysis.	November 30, 2025
Deploy transmitters on a subset of individuals banded during migration.	November 30, 2025
Stable isotope analysis of migration season feather samples.	February 28, 2026
Assign breeding origin to migratory birds using the isotope base map (Activity 1).	June 30, 2026
Quantify the importance of MN as breeding and stopover habitat to inform long-term management	June 30, 2026
strategies.	

## Activity 3: Assess the risk of environmental contaminant exposure to migratory birds in MN based on breeding origin.

Activity Budget: \$23,400

#### **Activity Description:**

Birds can bioaccumulate environmental contaminants in their tissues. In addition, these contaminants can biomagnify across trophic levels meaning that organisms feeding at higher trophic levels may experience the greatest exposure. Environment contaminants like methylmercury can lead to reproductive and/or behavioral impacts. We will leverage existing feather samples from birds (n = 100) that have been previously analyzed for total mercury and PFAS (per- and poly-fluoroalkyl substances). We will analyze feathers from these birds to estimate their breeding origins using stable isotope analysis. This will allow us to identify geographic areas of most likely exposure in and outside of MN. We will quantify the relative risk of MN birds to contaminant exposure and also assess whether this technique could be useful for continent-scale contaminant monitoring.

Outcome: Quantify the relative exposure risk of MN breeding birds to mercury and PFAS based on breeding origin.

#### **Activity Milestones:**

Description	Completion Date
Milestone 1: Feather samples analyzed for stable isotopes.	January 31, 2024
Milestone 2: Assign geographic origins based on stable isotope analysis.	May 31, 2024
Milestone 3: Comparative analysis of geographic origins and contaminant concentrations to identify	August 31, 2025
geographic locations of most likely exposure.	

## 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?

Hawk Ridge Bird Observatory will compile and publish results at both a local and national scale. Results and findings will be shared with land managers, state and federal government agencies, and non-profit organizations working to conserve these species. Additional funding sources will be acquired if needed for continuing work.

## Other ENRTF Appropriations Awarded in the Last Six Years

Name	Appropriation	Amount Awarded
Quantifying Exposure of Minnesota's Raptors to	M.L. 2019, First Special Session, Chp. 4, Art. 2, Sec. 2,	\$250,000
Mercury and PFAS	Subd. 03c	

## Project Manager and Organization Qualifications

#### Project Manager Name: Emily Pavlovic

Job Title: Graduate Student - Integrated Biological Sciences University of Minnesota Duluth

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

Emily Pavlovic is completing her master's degree in Integrated Biosciences this summer (2022) at the University of Minnesota Duluth. Her thesis was centered around estimating natal origins and migratory patterns of raptors banded at Hawk Ridge. She used a stable isotope approach which shows great promise for understanding other variables (e.g., morphology, plumage variation, and contaminant exposure) in a geographic context. She hopes to expand this work to include more technology and more species to better understand where Minnesota birds spend their entire lives. Emily has a background in ecology and biochemistry including extensive lab and fieldwork. She will continue working with Hawk Ridge staff after graduating.

Organization: Hawk Ridge Bird Observatory

#### **Organization Description:**

Hawk Ridge Bird Observatory is a 501 (c) 3 non-profit that manages the Hawk Ridge Nature Reserve. The mission of Hawk Ridge Bird Observatory is to protect birds of prey and other migratory birds in the Western Lake Superior Region through research, education, and stewardship. Regular fall counting and banding have occurred every year since 1972.

## Budget Summary

Category /	Subcategory	Description	Purpose	Gen.	% Bana	# FTF	Class	\$ Amount
Name	or type			gible	fits	FIC	Staff?	
Personnel				Sivic	1103		Starr	
Passerine		Operate passerine banding during summer and fall			0%	200		\$11,670
Bander		season						
Raptor Bander		Operate raptor banding during the fall season			0%	0.5		\$6,668
Administrative		Manage project and finances			0%	0.1		\$3,569
Primary Researcher		Project manager			0%	0.5		\$21,093
							Sub Total	\$43,000
Contracts and								
Services								
							Sub	-
<b>F</b>							Total	
Equipment,								
Supplies								
							Sub	-
							Total	
Capital								
Expenditures								<u> </u>
		Stable isotope analysis	Samples will be sent to a laboratory for					\$99,000
			sample is \$225					
	1	Transmitters	48 transmitters will be deployed on					\$57.000
			birds in MN to learn about movements					, - ,
			and create connectivity between					
	L		breeding and migration					
							Sub Total	\$156,000
Acquisitions and								
Stewardship								
							Sub	-
							Total	
Travel In Minnesota								

				Sub	-
				Total	
Travel					
Outside					
Minnesota					
				Sub	-
				Total	
Printing and					
Publication					
				Sub	-
				Total	
Other					
Expenses					
				Sub	-
				Total	
				Grand	\$199,000
				Total	

## Classified Staff or Generally Ineligible Expenses

Category/Name	Subcategory or	Description	Justification Ineligible Expense or Classified Staff Request
	Туре		

## Non ENRTF Funds

Category	Specific Source	Use	Status	Amount
State				
			State Sub	-
			Total	
Non-State				
			Non State	-
			Sub Total	
			Funds	-
			Total	

### Attachments

#### **Required Attachments**

*Visual Component* File: <u>4b1b8dbd-244.pdf</u>

#### Alternate Text for Visual Component

Examples of isotopic maps. A map showing the location of banding stations across Minnesota that will assist with sample collection....

#### *Financial Capacity* File: e885ff7b-794.pdf

#### Board Resolution or Letter

Title	File
HRBO Board Resolution	<u>227b942e-3a5.pdf</u>

#### 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?  $$\rm N/A$$
- 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

## Linking breeding and migratory bird populations in MN



Figure 1. Shows an example isotope map that can be used for assigning geographic origin. We will make a higher resolution map for the state of Minnesota. Each color on the map represents a different isotope signature. A bird grows a feather with the isotopic signature of its environment. When it migrates to a new location it retains this signature and therefore can be traced back.



Figure 2. Past research at Hawk Ridge has shown that stable isotope analysis can be a useful tool for linking migratory populations to breeding origins. Map shows 10% of the breeding range (green) that is the most likely origin for Sharp-shinned Hawks migrating through Duluth in the fall based on stable isotope analysis. The red star shows the location of Hawk Ridge.



Figure 3. The green map icons across Minnesota show the location of breeding bird banding stations where we will collect breeding bird feathers to create the isotope map.

