



Environment and Natural Resources Trust Fund

2027 Request for Proposal

General Information

Proposal ID: 2027-574

Proposal Title: Understanding Minnesota's Migratory Bats to Advance Conservation

Project Manager Information

Name: Mary Mallinger

Organization: Minnesota Zoological Board

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Project Basic Information

Project Summary: We will advance bat conservation by deploying transmitters that leverage Minnesota's expanded Motus wildlife tracking network to document movement patterns and by evaluating new long-term transmitter attachment methods.

ENRTF Funds Requested: \$568,000

Proposed Project Completion: June 30, 2030

LCCMR Funding 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.

Migratory bat populations that reproduce in and traverse Minnesota (Eastern Red, Hoary, and Silver-haired bats) are experiencing unprecedented threats from climate change, habitat modifications, and energy development. These threats are likely to cause >50% declines in Hoary Bat populations by 2050, prompting the U.S. Fish and Wildlife Service to schedule a species status assessment for potential listing actions. Unfortunately, data on movement ecology that can inform conservation actions to minimize regulatory burden are currently not available. Documenting migratory movement of bats has been hindered by an inability to track their long-term movements. Advances in radio-transmitter technology and the recently expanded coverage of the Motus wildlife tracking system (Motus network) in Minnesota provide new opportunities to track long-distance migratory bat movement. However, standard glue attachments last only about 10 days, far too short to gain adequate insight into complex migratory movement patterns. Advanced attachment techniques are available but require testing to gain information on correct use for Minnesota's migratory bat species. Once adequate information is available, deploying long-term tracking devices will add a wealth of information.

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.

Minnesota's Environment and Natural Resources Trust Fund recently invested in expanding the Motus network to provide opportunities to understand the movement ecology of species throughout the state, region, and continent. We will leverage this investment and our experience with the Motus network to gather the first movement data on migratory bats in Minnesota.

Capturing high-flying long-distance migratory bats requires considerable effort and technical expertise. To maximize the likelihood of gaining information on migratory movements, both tags and attachment methods should facilitate data collection as long as possible. Therefore, we will use state-of-the-art Motus-compatible tags and long-term attachment techniques to ensure that high-quality, long-term data are collected. Due to the novelty of tags and methods, we will explore how well different attachment techniques support the collection of long-term bat movement data and develop best practices for deploying tracking devices on migratory bats. In addition to movement after capture, we will infer summer reproductive areas via isotope analysis to examine which movement patterns reflect resident versus transient individuals.

This work will provide critical information for managers to develop conservation efforts that will be most effective in protecting bat populations.

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?

Minnesota's three migratory bat species are considered Species of Greatest Conservation Need in the 2015-2025 and proposed 2025-2035 State Wildlife Action Plans. This project will develop best practices for gathering information about the movement ecology of these species and conduct the first study of migratory bat movements in the state. This information will allow managers to develop targeted conservation actions that have the greatest potential to enhance their populations in light of emerging threats. Conservation action enacted quickly will reduce the potential for listing and greater regulatory burden in the future.

Activities and Milestones

Activity 1: Develop best practices for long-term attachment of tracking devices to bats.

Activity Budget: \$110,770

Activity Description:

The Minnesota Zoo will leverage its expertise in veterinary medicine and wildlife conservation, partnering with bat experts and local wildlife rehabilitators to develop and test protocols that allow for the longest period of data collection without impacting bat health and welfare.

We will explore the ability of two emerging attachment techniques, collars and sutures, to support long-term data collection of bats by affixing transmitters to a surrogate species, Big Brown Bats. The use of resident Big Brown Bats provides the highest likelihood that we can track individuals through the life of the tag (~4 - 6 months) with the fewest complicating factors, thus providing the highest quality data on attachment technique and tag longevity. Big Brown Bats from a wildlife rehabilitator and wild caught individuals will be utilized for this effort, providing additional data that can improve our understanding of the efficacy of rehabilitation efforts for supporting bat populations.

Activity Milestones:

Description	Approximate Completion Date
Develop initial attachment protocols for affixing transmitters to bats.	September 30, 2027
Deploy up to 20 BluBat+ tracking devices to trial attachment methods.	May 31, 2028
Deploy up to 20 additional Blubat+ tracking devices to trial attachment methods.	May 31, 2029
Summarize results of attachment methodology and finalize document detailing best practices for transmitter attachment.	June 30, 2030

Activity 2: Describe movement patterns of migratory bats in Minnesota.

Activity Budget: \$457,230

Activity Description:

We will leverage our previous experience with the Motus network in Minnesota. Motus-compatible Bluetooth tags that combine mobile and Motus networks have become available in the last ~18 months, providing unprecedented opportunity to track movements of small animals such as bats. Because these tags require additional antennas for the new Bluetooth frequency, we will upgrade up to 6 Motus towers to increase compatibility.

We will attach transmitters to migratory bats (Eastern Red, Silver-haired and Hoary bats) both released from a wildlife rehabilitator and captured in the wild. We plan to affix transmitters to up to 10 rehabilitated bats each spring/summer (30 total) and up to 30 wild captured bats in both 2028 and 2029 (60 total). Capture locations in multiple regions of the state (2-3) will be chosen based on consultation with DNR and acoustic records.

Additionally, we will use hair samples from both captured and rehabilitated migratory bats to assign the likely geographic region in which the hair was grown via hydrogen isotope analysis. Analyses will provide insight into summer maternity grounds. These data, combined with tracking data derived from transmitters, will allow us to determine likely migratory connectivity between summer and winter areas of Minnesota's bats.

Activity Milestones:

Description	Approximate Completion Date
Deploy up to 10 tracking devices on rehabilitated migratory bats.	November 30, 2027
Deploy up to 10 tracking devices on rehabilitated migratory bats.	May 31, 2028
Upgrade up to 6 Motus stations with new 2.4Ghz antennas for Bluetooth tags.	August 31, 2028
Conduct first year of capture activities and deploy up to 30 transmitters on migratory bats.	November 30, 2028

Deploy up to 10 tracking devices on rehabilitated migratory bats.	May 31, 2029
Conduct second year of capture activities and deploy up to 30 transmitters on migratory bats.	November 30, 2029
Process hair samples for hydrogen isotopes.	February 28, 2030
Analyze and report on migratory bat movements in Minnesota.	June 30, 2030

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Agnes Hutchinson	Wildlife Rehabilitation Center of Minnesota	Medical Director at the Wildlife Rehabilitation Center. Dr. Hutchinson will identify rehabilitated bats suitable for transmitter deployment and facilitate the attachment of transmitters to them.	Yes
Michael Whitby	Bat Conservation International	Whitby is the Director of Bats and Wind Energy Program and is based in Duluth. He will provide expertise on bat capture, tag technology and attachment methodology. He will also help to secure necessary permits and conduct permitted capture activities.	Yes
Tami Vogel	Wildlife Rehabilitation Center of Minnesota	Executive Director of the Wildlife Rehabilitation Center. Will coordinate activities to support implementation of Activities 1 and 2.	Yes

Dissemination

Describe your plans for dissemination, presentation, documentation, or sharing of data, results, samples, physical collections, and other products and how they will follow ENRTF Acknowledgement Requirements and Guidelines.

We will coordinate closely with the Department of Natural Resources and other management authorities so that our results are best able to inform conservation actions for migratory bats in Minnesota. The project team is dedicated to open science principles. All data will be publicly available via NAbat, Movebank, the Motus website and other outlets. We also will disseminate results via scientific presentations at professional conferences and two scientific journal articles.

Additionally, we will work with the communications departments of the Minnesota Zoo, Bat Conservation International, and the Wildlife Rehabilitation Center to inform the public about project activities and findings through outlets including newsletters, social media channels, and websites. Environment and Natural Resources Trust Fund will be acknowledged through use of the ENRTF logo and/or attribution language on all communications, publications, and data archives.

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?

This project will have lasting impacts by establishing data collection protocols on migratory bat movements.

Additionally, we will provide the first-ever data set on migratory bat movements throughout Minnesota and inform future bat conservation efforts statewide. Protocols and data will be stored long-term on publicly accessible repositories (OSF.io, movebank, and Motus), so that results can be used into perpetuity for management decisions.

We do not anticipate that this project will require long-term funding. Future projects may add to our understanding of migratory bat movement through the collection of additional data but would be separate discrete efforts.

Other ENRTF Appropriations Awarded in the Last Six Years

Name	Appropriation	Amount Awarded
Expanding the Statewide Motus Wildlife Tracking Network	M.L. 2025, First Special Session, Chp. 1, Art. 2, Sec. 2, Subd. 03j	\$234,000

Project Manager and Organization Qualifications

Project Manager Name: Mary Mallinger

Job Title: Conservation Biologist

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

Mary Mallinger is a Conservation Biologist at the Minnesota Zoo. She received a B.S. in Wildlife Ecology from the University of Wisconsin, Madison and a M.S. in Environmental Science from the University of Rhode Island. She has studied invasive forest insects, prairie nesting birds, black bears, and more. She currently manages the bison conservation program at the Minnesota Zoo and is coordinator for the Minnesota Bison Collaborative. In addition, she is project manager for the ENRTF-funded "Expanding the Statewide Motus Wildlife Tracking Network" which began in July 2025. She has direct experience with the installation and operation of Motus stations and facilitates many partnerships with host sites across the state.

Organization: Minnesota Zoological Board

Organization Description:

The Minnesota Zoo is a unique state agency. Established in 1978 to provide Minnesota residents and guests with an opportunity to experience animals from the exotic to the familiar, today the Zoo is one of the State's premier cultural, educational, and conservation institutions.

The Zoo's mission is to connect people, animals and the natural world to save wildlife. With 1.4 million annual guests, and state-wide outreach programs reaching thousands more, the Zoo is well-positioned to strengthen Minnesotans' awareness and understanding of our state's commitment to wildlife, science, and conservation. The Zoo is the State's largest environmental educator with >500,000 participants in Zoo education programs.

The Zoo is also a leader in conservation – directing efforts and partnering with others on a variety of initiatives in Minnesota and across the globe. Over the past decade, the Zoo has enhanced efforts to focus on Minnesota wildlife, including projects to conserve moose, bison, turtles, prairie butterflies, and freshwater mussels and to expand the Motus wildlife tracking network in the state.

The Minnesota Zoo has a proven record of using its resources effectively and matching the State's investment.

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	\$ Amount
Personnel								
Conservation Biologist		Project Manager. Overall project management and coordination of Activities 1 and 2, including field work.			37%	0.9	X	\$131,600
Zoo Veterinarian		Support development of attachment protocol. Affix transmitters to bats and train partners and project team in attachment methods.			22%	0.6	X	\$99,100
							Sub Total	\$230,700
Contracts and Services								
Bat Conservation International	Service Contract	Contractor will provide expertise on advanced attachment techniques and technology for tracking migratory bats. They will support mist-netting efforts (up to 30 nights per year) and deployment of transmitters of rehabilitated and wild-caught bats. Contractor will provide training and support acquisition of a federal permit. Includes travel costs.				0.9		\$210,000
Wildlife Rehabilitation Center	Service Contract	Contractor will care for and provide rehabilitated bats prior to release and for deployment of transmitters. Contractor will also support deployment of transmitters on these bats.				0.15		\$25,000
Central Appalachian Stable Isotope Facility	Service Contract	Contractor will analyze bat fur for hydrogen isotope levels to infer movements.				-		\$2,000
							Sub Total	\$237,000
Equipment, Tools, and Supplies								
	Tools and Supplies	Mist net capture supplies	Bat capture equipment following best practices to limit the spread of white-nose syndrome. Includes 3 triple high pole systems, 3 single high pole					\$13,000

			systems, and 24 mist-nets of multiple sizes and 1 acoustic lure.					
	Tools and Supplies	Bat tracking tags	Transmitters (Blubat+ and powertags) to monitor bat movements; 130 tags, blu+ and motus service, attachment supplies. 2 activators for powertags. 3 handheld trackers.					\$51,600
	Equipment	Equipment for portable Motus station	Equipment to construct portable Motus station for use while capturing bats. Includes 1 Motus compatible receiver, portable tripod, 434 and 2.4 Ghz antennae, and portable power source.					\$7,000
	Equipment	2.4Ghz Antennae	Upgrade up to 6 Motus towers to support monitoring for new 2.4 Ghz tags.					\$4,000
	Tools and Supplies	Veterinary supplies	Materials necessary to safely immobilize up to 130 bats for transmitter deployment.					\$3,000
							Sub Total	\$78,600
Capital Equipment								
							Sub Total	-
Acquisitions and Stewardship								
							Sub Total	-
Travel In Minnesota								
	Miles/ Meals/ Lodging	Fuel, food, and accommodation for work associated with Activities 1 and 2. Anticipate initial scouting trips (15 total nights) and capture field work in year 1 and up to 30 nights / year for biologist and 20 nights / year for veterinarian in years 2 and 3. Reimbursement rates as allotted per the State of Minnesota travel regulations.	Travel to implement Activities 1 and 2, including scouting trips in year 1 to identify optimal capture sites and travel to conduct capture activities in years 1-3.					\$21,700
							Sub Total	\$21,700

Travel Outside Minnesota								
							Sub Total	-
Printing and Publication								
							Sub Total	-
Other Expenses								
							Sub Total	-
							Grand Total	\$568,000

Classified Staff or Generally Ineligible Expenses

Category/Name	Subcategory or Type	Description	Justification Ineligible Expense or Classified Staff Request
Personnel - Conservation Biologist		Project Manager. Overall project management and coordination of Activities 1 and 2, including field work.	Classified : A classified staff position will be partially supported by these ENRTF funds. This staff member will have the necessary expertise required to successfully coordinate Activities 1 and 2. The ENRTF funding will make it possible for the staff member to work on this project for the percentage of time indicated in the budget. Without this funding they would not be able to support this project with their time. Responsibilities for the classified staff will be reprioritized and reallocated as necessary to support this project. This staff member will have completed their current ENRTF project which is funding their time by the start of this proposed project.
Personnel - Zoo Veterinarian		Support development of attachment protocol. Affix transmitters to bats and train partners and project team in attachment methods.	Classified : A classified staff position will be partially supported by these ENRTF funds. This staff member will have the necessary expertise required to successfully coordinate Activities 1 and 2. The ENRTF funding will make it possible for the staff member to work on this project for the percentage of time indicated in the budget. Without this funding they would not be able to support this project with their time. Responsibilities for the classified staff will be reprioritized and reallocated as necessary to support this project.

Non ENRTF Funds

Category	Specific Source	Use	Status	Amount
State				
Cash	Minnesota's Zoo General Operating Budget	Administrative costs, utilities and other expenses associated with implementation of activities, estimated at 15% of the total request.	Secured	\$85,200
			State Sub Total	\$85,200
Non-State				
			Non State Sub Total	-
			Funds Total	\$85,200

Total Project Cost: \$653,200

This amount accurately reflects total project cost?

Yes

Attachments

Required Attachments

Visual Component

File: [47c7bc7e-323.pdf](#)

Alternate Text for Visual Component

A graphic with title of the project and overall goal stated as "Inform bat conservation by tracking imperiled migratory bats and developing research methods." Two photos of bats, one with a tracking device, and one picture of Motus antennas. Minnesota Zoo, Wildlife Rehabilitation Center, and Bat Conservation International logos included....

Supplemental Attachments

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

Title	File
Wildlife Rehabilitation Center Letter of Support.	6a846bf3-bb7.pdf
Bat Conservation International Letter of Support	355406c6-ec1.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 Commissioner's Plan 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:

Seth Stapleton, Minnesota Zoo; Michael Whitby, Bat Conservation International.

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