Environment and Natural Resources Trust Fund

2024 Request for Proposal

General Information

Proposal ID: 2024-054

Proposal Title: Detecting Window Collisions of Minnesota's Migratory Bird Species

Project Manager Information

Name: Robert Blair

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

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Project Basic Information

Project Summary: We propose developing and implementing a system that will remotely detect bird-building collisions in order to understand where and when collisions occur and expeditiously implement mitigation at identified collision hotspots.

Funds Requested: $393,000

Proposed Project Completion: June 30, 2027

LCCMR Funding Category: Foundational Natural Resource Data and Information (A)

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?

During the Project and In the Future

Narrative

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

Bird populations across North America have decreased by nearly one-third over the past fifty years. Birds contribute to key ecosystem services like pollination, seed dispersal and nutrient cycling, all of which are threatened by continued population declines. Bird-building collisions are a major driver of population losses, killing upwards of a billion birds in the United States annually. Migratory species are especially vulnerable to collisions during their yearly journeys to and from their breeding and wintering grounds.

Minnesota's unique mix of diverse habitats allow nearly 250 bird species to breed within the state, making it an important location for bird diversity. Additionally, the Twin Cities straddles a major migratory flyway along the Mississippi River, funneling millions of migrating birds through a large urban area. Two years of research at the University of Minnesota - Twin Cities (UMTC) has already documented substantial collision mortality along this flyway, making UMTC an ideal location to both study bird-building collisions and to remediate the damage caused by them to migrating populations. Buildings can be made bird-safe through a variety of collision mitigation solutions, but for those solutions to be properly implemented, we need to know where, when and why these collisions occur.

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.

Quantifying collision incidence at buildings has historically been accomplished through documentation of dead and injured birds found on the ground. This after-the-fact approach is susceptible to several sources of under-detection bias that can skew our understanding of where collisions occur. Humans and animal scavengers often remove bird carcasses before they can be detected and many birds are able to fly off after initial impact, succumbing to their injuries elsewhere. Additionally, the types of building monitoring surveys required to collect collision data are highly time and labor intensive.

To address these limitations and provide a more efficient means of revealing where, when and why bird-building collisions occur, we propose developing and implementing a novel collision-detection system that will continuously monitor for and automatically identify bird-building collisions as they happen. Such a system will not only greatly increase our understanding of bird-building collision dynamics but will also allow for targeted solutions to problem buildings, quicken the pace of implementing mitigation methods and reduce costs associated with mitigation. Expediting the process of identifying collision hotspots and implementing mitigation measures promises to save thousands of birds each migratory cycle and ameliorate the impact that buildings exact on Minnesota's birds.

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 is focused on the conservation of Minnesota's bird species through the reduction of bird-building collisions, a major source of avian population declines. Successful development and implementation of our collision detection system will elucidate where, when and why bird-building collisions occur. Learning where and when collisions occur will allow for hazardous buildings to be quickly and accurately identified and prioritized for mitigation action. Learning why collisions occur will help to inform best practices for preventing collisions and the types of mitigation techniques that will be most successful at identified hotspots.

Activities and Milestones

Activity 1: Testing and development of collision detection system

Activity Budget: $135,865

Activity Description:
In the first year of funding, we will develop our collision detection system through data collection and testing. Using high fidelity recording devices, we will take real-world measurements of bird-building collisions at sites of high collision incidence at UMTC. These measurements will be used to inform us of the parameters needed to calibrate our recording devices and will be used to develop methods to replicate bird-building collisions in a lab setting. We will then lab-test and evaluate different collision detection devices via a process of simulating window collisions. We will evaluate devices that measure window impacts through vibration and devices that measure window impacts through sound and will focus on testing devices that are inexpensively produced. From collision simulation tests, we will select a device to further develop based on considerations of accuracy, coverage and cost. We will continue to develop our chosen collision detection device until we arrive at a product that is widely deployable, cheap to manufacture and can consistently diagnose bird-building collisions as they occur. Development will be weighted heavily in the first year of funding but will continue throughout the project as we refine and add to our system.

Activity Milestones:

Description	Approximate Completion Date
Gather measurements of bird-building collisions	October 31, 2024
Test, develop and refine collision detection devices	March 31, 2025

Activity 2: Deployment and refinement of collision detection system

Activity Budget: $158,211

Activity Description:
We will deploy our collision detection system in the spring of 2025. Using a dataset of bird-building collision hotspots at UMTC, we will install our system at a known collision culprit. The system will be programmed to run continuously during the spring migratory season from April - May, with periodic checks to make sure the system is functioning properly. While our system is passively collecting data, a team of volunteers will also conduct daily surveys around the building perimeter to assess collision incidence through birds found on the ground.

At the conclusion of the spring migratory season, we will collect our devices and analyze our initial results to determine if system refinements need to be made. During this period, we will add a machine learning component to our collision detection system, which will be trained from video taken during our first deployment and will be used to increase the confidence of identified collision detections in subsequent system deployments. We will redeploy our enhanced system during the fall migratory season (September-October), continuing ground surveys and periodic system checks. System analysis and refinement will continue during the winter of 2025/2026, leading to one final deployment spring 2026.

Activity Milestones:

Description	Approximate Completion Date
Deployment 1	May 31, 2025
System analysis and refinement	August 31, 2025
Development of machine learning system	August 31, 2025
Deployment 2	October 31, 2025
System analysis and refinement	March 31, 2026

Deployment 3	May 31, 2026

Activity 3: Data analysis and evaluation of collision detection system

Activity Budget: $98,924

Activity Description:
Following our third deployment, we will process the data gathered by our collision detection system. We will compare collisions detected by our system to collisions identified through ground surveys to evaluate the benefits of remote collision detection over traditional survey-based methods. We will also use our data to explore other factors that may contribute to increased collision incidence. We will publish the results of our study in a peer-reviewed journal to publicly disseminate our findings.

Additionally, we will generate reports to guide the implementation of our collision detection system in other settings. These reports will include all information needed for our system to be replicated and deployed by others concerned with tracking bird-building collision incidence. Through evaluation of our system, we will also provide recommendations for improvement and options to implement collision detection systems cheaply and efficiently.

Activity Milestones:

Description	Approximate Completion Date
Data analysis and system evaluation	June 30, 2027

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Christopher Feist	Sant Anthony Falls Laboratory of the University of Minnesota	Chris Feist will be serving as a co-PI on this project and will help with the development and implementation of collision detection sensors. Chris is an Associate Engineer at SAFL where he has previously worked on detecting bird collisions with turbine blades in wind energy production.	Yes
Christoper Milliren	Saint Anthony Falls Laboratory at the University of Minnesota	Chris Milliren will be serving as a co-PI on this project and will help with the development and implementation of collision detection sensors. Chris is an associate engineer at SAFL where he's designed and built remote sensor systems and a portable anechoic chamber to assess the hearing capabilities of eagles.	Yes
Andrew Hallberg	Conservation Sciences Graduate Program at the University of Minnesota	Andrew Hallberg is earning his PhD in Conservation Sciences. He is the creator of the Stop the Thud campaign, a citizen science project identifying buildings on the University of Minnesota Twin Cities campus that are prone to bird building collisions and designing means of remediating their architectural features.	Yes
Joanna Eckles	American Bird Conservancy	Joanna Eckles will serve as a project advisor. Joanna has developed bird-building collision research programs at the University of Minnesota and Audubon Minnesota and now works at the American Bird Conservancy where she is a coordinator of the Bird City Network initiative.	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 work be funded?

Our results will be used to remediate collision hotspots at UMTC and to provide guidance for remediation elsewhere. At UMTC, we will present our findings to the Office of Sustainability and Facilities Management to retrofit hazardous buildings and make our campuses safer for birds to navigate. We will also use our findings to improve architectural guidelines for limiting bird-building collisions. Outlets for revised guidelines include B3 (which provides standards for the sustainable construction of state-funded buildings), Audubon Minnesota's Bird City program and the American Bird Conservancy's Bird City Network (which are both focused on community planning for urban bird conservation).

Other ENRTF Appropriations Awarded in the Last Six Years

Name	Appropriation	Amount Awarded
Minnesota Master Naturalist: Nature For New Minnesotans	M.L. 2021, First Special Session, Chp. 6, Art. 6, Sec. 2, Subd. 05d	$293,000

Project Manager and Organization Qualifications

Project Manager Name: Robert Blair

Job Title: Professor and Department Head

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

Dr. Robert Blair is a professor and head of the Department of Fisheries, Wildlife, and Conservation Biology at the University of Minnesota. His research area of expertise is urban avian ecology and he has spent more than thirty years documenting how birds use urban environments in order to help planners and architects design bird-friendly cities. His

background specific to this project includes working with Project BirdSafe and Audubon – Minnesota which collected birds that collided with buildings in the downtown of Saint Paul and Minneapolis for more than 18 years. This project provided the basis of the three-year study of US Bank Stadium which examined bird-building collisions with respect to the Vikings stadium and other downtown buildings to provide recommendations for bird-friendly remediation. The results from both these projects helped inform bird-specific design standards in the Minnesota B3 Guidelines used in the construction of any state-funded project.

Dr. Blair has guided and managed several LCCMR projects including the citizen-science based Minnesota Bee Atlas, which discovered several new species of hole-nesting bees in the state as well as gathered information from many disparate sources of information on bee distribution in Minnesota into a single source. He has also managed several science outreach projects that have focused on providing professional development for science educators on how to use citizen science in the classroom.

In this project, Dr. Blair will be managing the project, providing guidance for a graduate students who is studying the hazards of migration on migratory birds passing through the Twin Cities, and collaborating with researchers from the Saint Anthony Falls Laboratory in designing inexpensive ways to monitor bird-building collisions.

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

Organization Description:
The College of Food, Agriculture, and Natural Resource Sciences is a leader in research and innovative scientific discovery, both within the University of Minnesota system and nationwide. In FY2022 alone, CFANS researchers received more than $95 million dollars in sponsored awards. To help facilitate the success of its researchers, CFANS and the University offer state-of-the-art facilities; training, tools and templates for researchers and staff; as well as administrative support to help connect researchers to funding, manage grant proposals and maintain compliance with all requirements.

The Department of Fisheries, Wildlife, and Conservation Biology seeks ways to advance informed natural resource decision-making about wild animal populations and the habitats and landscapes they depend on. We are active throughout Minnesota, the Upper Midwest, the US, and the world. We have research facilities in five buildings on the Saint Paul campus, which includes computer laboratories, analytical facilities, wet-labs with dedicated wells and water conditioning equipment, and fish growth facilities. Several FWCB faculty are affiliated with the Bell Museum of Natural History.

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	$ Amount
Personnel								
Project Engineer		Create and test sensor system			36.8%	0.27		$75,538
Project Engineer		Create and test sensor monitoring system			36.8%	0.3		$87,464
Principal Investigator		Manage Project			36.8%	0.09		$27,028
Field Assistants		Undergraduate students to assist with field work			0%	0.63		$20,250
Graduate Student		Implement system, collect and analyze data, make recoomendations			24.1%	1.5		$158,220
							Sub Total	**$368,500**
Contracts and Services								
							Sub Total	-
Equipment, Tools, and Supplies								
	Equipment	Mock Impact Device	Test bird impact					$400
	Equipment	Mock Window	Window to test impact					$1,500
	Tools and Supplies	High Resolution Accelerometer	Detection Device					$1,200
	Tools and Supplies	Miscellaneous Hardware	To mount the above equipment					$400
	Equipment	Sensor Options 1,2, and 3	Test sensors					$6,000
	Equipment	Sensors for First Deployment	Additional sensors to deploy; picked from test sensors					$5,000
	Equipment	Sensors for Second Deployment	Sensors to deploy in second round of testing					$5,000
	Equipment	Sensors for Third Deployment	Sensors to deploy in third round of testing					$5,000
							Sub Total	**$24,500**

Capital Expenditures								
							Sub Total	**-**
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 Total	**$393,000**

Classified Staff or Generally Ineligible Expenses

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

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: 971cfb0f-1c2.pdf

Alternate Text for Visual Component

Our graphic shows connected three elements. 1) A bird colliding with a window and a sensor recording the collision. 2) A map of collisions at the University of Minnesota, Twin Cities with images of collision victims. 3) A window on campus retrofitted with a patterned film to prevent bird strikes....

Optional Attachments

Support Letter, Photos, Media, Other

Title	File
Authorization Letter from UMN SPA	ed6f1aae-fc4.pdf

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?

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?

Yes, Sponsored Projects Administration

Does your project include the design, construction, or renovation of a building, trail, campground, or other capital asset costing $10,000 or more?

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?

No