



Environment and Natural Resources Trust Fund

2027 Request for Proposal

General Information

Proposal ID: 2027-417

Proposal Title: Evaluating American Kestrel Declines to Inform Conservation Action

Project Manager Information

Name: Tricia Markle

Organization: Minnesota Zoological Board

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Project Basic Information

Project Summary: The Minnesota Zoo and partners will study the long-term decline of American kestrels; addressing knowledge gaps related to demographics, diet, movements, and potential threats to inform conservation action.

ENRTF Funds Requested: \$449,000

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.

The American kestrel (*Falco sparverius*), a small, cavity-nesting falcon, is a summer resident in Minnesota that migrates south to overwinter. Kestrels are considered a species of greatest conservation need in Minnesota, with total population declines of 78% since 1967. This persistent, long-term decline has been observed across its range, with a nearly 2% annual decrease over the past several decades. This trend is alarming, but specific causes remain speculative. Habitat loss and degradation, loss of nest cavities, and impacts from pesticides are among the factors hypothesized as drivers of the decline. Land use changes can reduce both kestrel prey abundance and nest cavity availability, presenting challenges for successfully rearing young. Agricultural pesticides may also have unintended indirect (e.g. on the kestrel's insect prey base) and direct (i.e. health impact) consequences on kestrel populations. Developing appropriate conservation actions requires establishing a better understanding of the impacts of these threats. To inform management, we also must address gaps in our understanding of kestrel life history, including demographic rates and detailed spatial information about their habitat preferences and migrations.

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.

Although many questions remain regarding the decline of American kestrels, several new technologies are now available to help researchers address these knowledge gaps. We will work with partners to expand the network of nest boxes available to kestrels in different parts of the state. Nest box monitoring will inform whether nest cavities are a limiting factor in Minnesota and provide the opportunity to gather data on annual survival and reproductive success. Further, we will conduct a comprehensive study of kestrel diet using nest box cameras in combination with DNA metabarcoding of fecal matter to obtain a diet profile of prey items. This information will help to identify regional differences in diet, including in areas with different land use practices. To detect pesticides, we will capitalize on recent advances in laboratory capabilities and collect samples to screen for hundreds of minute chemicals that may be present in the environment, prey, or kestrel blood. Finally, we will leverage Minnesota's recently expanded Motus wildlife tracking network and deploy transmitters (GPS and hybrid radio tags) on kestrels to better quantify fine-scale summer habitat use, migration routes, overwintering sites, and potential threats. Combined, these data will provide key information to help guide future conservation action.

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?

Without targeted conservation action, American kestrels in Minnesota are likely to continue their decline. To inform and support their recovery, the Minnesota Zoo and partners will:

1. Increase nest box availability to help improve reproductive success of kestrels in Minnesota.
2. Monitor nest boxes and establish baseline health metrics of kestrels, particularly as related to the presence of pesticides in the environment.
3. Create a diet profile for kestrels to determine how prey choice differs among regions and by land use practice.
4. Track kestrels locally and throughout migration to better establish key habitat needs and quantify movements and survival.

Activities and Milestones

Activity 1: Install nest boxes to support reproductive success and population monitoring

Activity Budget: \$112,800

Activity Description:

Nest cavities are believed to be a limiting resource for American kestrels, as land management practices can remove older trees that provide natural cavities. Several groups in Minnesota have established networks of nest boxes to support kestrel populations. In addition to providing places to raise young, nest boxes also offer an excellent opportunity to monitor population trends and reproductive success. The Minnesota Zoo will work with several partners to support existing kestrel projects, as well as expand nest box availability in potential kestrel habitats. To explore impacts from landscape change, we will place new boxes in areas with different levels of agricultural activity. Nest boxes will be monitored weekly throughout the breeding season by staff and volunteers in different areas, including northern (Sax Zim Bog, Hawk Ridge) and central (Arden Hills Army Training Site, Dakota County, Three Rivers Parks) Minnesota. Our specific objectives are to determine nest box occupancy and quantify the number of returning pairs, eggs laid, and chicks successfully fledged. Our data will support efforts to identify regional trends in demographic rates and allow us to assess relationships to agricultural intensity. Experienced avian researchers on the project team will band kestrels for future identification.

Activity Milestones:

Description	Approximate Completion Date
Install nest boxes in areas with different levels of agricultural activity. Monitor nest boxes weekly.	August 31, 2029
Band kestrel adults and chicks for future identification.	August 31, 2029
Compile data and results, and report findings.	December 31, 2029

Activity 2: Develop a diet profile for kestrels and quantify pesticide prevalence

Activity Budget: \$175,000

Activity Description:

While the general diet of American kestrels is fairly well-studied, questions remain as to whether particular food resources are associated with higher survival, whether kestrels in different areas specialize in different prey, and what impact chemical contamination may be having on kestrel diet and health. DNA metabarcoding is a new tool that can use fecal samples to identify prey types and create a diet profile. This technology, combined with nest box cameras, will allow us to quantify prey types, compare diet in different areas, and evaluate the relationship between diet and health metrics (e.g., weight gain, survival) of kestrel chicks and adults. Additionally, pesticides may be directly (health) or indirectly (decreased food source/quality) contributing to kestrel declines. Pesticides such as neonicotinoids are water-soluble and can accumulate in waterbodies near agricultural areas, impacting the aquatic life stage of dragonflies, a key food resource. We will collect samples from the environment (e.g. water, vegetation, prey remains), along with kestrel blood, and leverage expanding laboratory capabilities to screen for hundreds of chemicals, including agricultural pesticides and rodenticides. We will investigate whether kestrel health and breeding success correlate with areas free from contamination.

Activity Milestones:

Description	Approximate Completion Date
Install up to 12 nest box cameras to collect information on diet.	April 30, 2029
Weigh chicks and collect blood and fecal samples for laboratory analyses.	August 31, 2029

Collect and submit environmental samples for pesticides screening.	August 31, 2029
Analyze data and write preliminary report.	April 30, 2030

Activity 3: Track kestrels to understand habitat use, migration patterns, and survival

Activity Budget: \$161,200

Activity Description:

Although nest box monitoring yields important data about kestrel demographic and reproductive rates during their time in Minnesota, it cannot provide information from their migrations and overwintering sites. To better understand drivers of the decline and develop appropriate conservation strategies, we need more comprehensive information throughout the annual cycle. We again will employ new technology to address this need. Tiny solar-rechargeable GPS and specialized hybrid radio transmitters can now be attached to birds as small as kestrels to track movements between summer and winter ranges. The specialized hybrid radio tags, which leverage both Motus and cellular technology, are sufficiently small to facilitate deployment on male kestrels and fledglings, which weigh less than adult females. Tracking will allow us to quantify key metrics including annual survival and return rates of adults and yearlings, identify the riskiest time period for kestrels (i.e., summer, migration, or overwintering), improve our understanding of the demographic drivers of the decline (e.g., low adult or juvenile survival), and estimate interannual site fidelity. Finally, transmitters will support the collection of fine-scale spatial data in Minnesota, which will provide a better picture of key habitat needs, daily movements, and home range size.

Activity Milestones:

Description	Approximate Completion Date
Deploy up to 60 tracking tags in 2028 and 2029.	August 31, 2029
Complete data collection and analyses quantifying kestrel movements and habitat use.	April 30, 2030
Draft report detailing spatial ecology findings.	June 30, 2030

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Emily Pavlovic	Hawk Ridge Bird Observatory	Avian Ecologist - assisting with nest box monitoring, bird banding, sample collection, and tracking tag deployment (Activities 1, 2, and 3).	Yes
Frank Nicoletti	Hawk Ridge Bird Observatory	Avian Ecologist - assisting with nest box monitoring, bird banding, sample collection, and tracking tag deployment (Activities 1, 2, and 3).	No
Mark Martell	Independent Contractor	Raptor Biologist - assisting with nest box monitoring, bird banding, sample collection, and tracking tag deployment (Activities 1, 2, and 3).	Yes
Mary Lee	Arden Hills Army Training Site	Environmental Protection Specialist - coordinates kestrel project for Arden Hills Army Training Site	No
Dana Franzen-Klein	U of Minnesota Raptor Center	Doctor of Veterinary Medicine and Medical Director of the Raptor Center. Specializes in wildlife and population medicine. Assisting with banding, sample collections (including blood draws), and attaching tracking tags (Activities 1, 2, and 3).	Yes
Clinton Dexter-Nienhaus	Friends of Sax Zim Bog	Head Naturalist for Friends of Sax Zim Bog. Assisting with nest box monitoring, banding, sample collection, and tracking (Activities 1, 2, and 3).	No
Alexis Grinde	Natural Resources Research Institute, Avian Ecology Lab, UMD	Wildlife Ecologist and PI in Avian Ecology Lab. Offering knowledge and expertise to support project.	No
Dale Gentry	Audubon Upper Mississippi River	Conservation Director with Audubon. Providing avian expertise support and connection with private landowners.	No
Tom Lewanski	Dakota County Parks	Providing land for installation of kestrel nest boxes and general support for project.	No
Steven Hogg	Three Rivers Park District	Providing land for installation of kestrel nest boxes and general support for project.	No

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.

Findings of this study will be shared with collaborators, relevant state and federal agencies, land managers, and local tribal nations to inform management efforts for American kestrels both in-state and across the geographic range. Manuscripts summarizing this research, key findings, and associated recommendations will be prepared and submitted for publication in the peer-reviewed scientific literature. We also will share information at scientific conferences through presentations and/or posters.

Zoo educators will incorporate details from this study into programming to promote conservation efforts in the state. In addition, information will be shared with members of the public through presentations and tabling at the Minnesota Zoo and other public events off-site. Important results and any associated conservation actions will be communicated through the Zoo's regular newsletters to member and donor households and via social media channels to the Zoo's large online following. Finally, the Environment and Natural Resources Trust Fund will be acknowledged through the use of the logo or attribution language on project print and electronic media, publications, signage, and other communications.

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?

Research outcomes will be shared with managers to help guide the long-term recovery of American kestrels in Minnesota. Installation of additional nest boxes will directly support reproductive success of kestrels in areas where nesting sites are lacking. Further, information on kestrel diet, health, and the potential impacts of pesticides, in addition to data on both short and long-range movements and habitat use, will provide key insights for management. The Zoo and our partners will continue to explore funding opportunities to improve our understanding of American kestrel declines and promote their recovery in Minnesota.

Project Manager and Organization Qualifications

Project Manager Name: Tricia Markle

Job Title: Wildlife Conservation Specialist

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

Dr. Tricia Markle has been employed as a Wildlife Conservation Specialist at the Minnesota Zoo for the past 8 years. She has a track record of successfully coordinating and implementing large conservation projects with multiple partners, including two previous LCCMR grants. Tricia has multiple scientific publications and regularly presents findings at professional meetings and public events. Her research has included wildlife road mortality mitigation, tracking and boosting populations of state threatened wood turtles, disease surveillance, and climate change impacts on salamanders. Experience with raptors has included five months in California conducting fieldwork on imperiled California Spotted Owls. Those efforts involved assisting with resighting, tracking, handling, and banding owls as part of a long-term research project. Work specifically with kestrels has included shadowing efforts of the Central Wisconsin Kestrel Research group in 2025. Tricia assisted with monitoring and banding of kestrels, and gained much insight from this decades-long program. In addition, Tricia is working with kestrel specialists at Arden Hills Army Training Site (AHATS) this spring to deploy and test new CTT tracking tags on a half dozen kestrels.

This proposal has been over a year in the making. It brings together an impressive coalition of experts from across Minnesota, who combined have a wealth of experience with American kestrels and with avian research and conservation. The project team includes research biologists with Hawk Ridge Bird Observatory, Sax Zim Bog, and Arden Hills Army Training Site who have ongoing kestrel nest box monitoring programs; raptor-specific veterinary expertise from the University of Minnesota Raptor Center, and avian expertise from the Natural Resources Research Institute Avian Ecology Lab at UMD, Audubon, and the Minnesota DNR. Finally, partners at Three Rivers Park District and Dakota County Parks will support the construction of nest boxes on their lands adjacent to agricultural areas.

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 engaging 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. Advancing the science of wildlife conservation is an important part of the Zoo’s work.

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								
Biologist and Project Manager: average 0.4 FTE x 3 years		Overall coordination of project activities. Assist with implementation of Activities 1, 2, and 3.			38%	1.2	X	\$171,200
Natural Resources Technician or similar: average 0.25 FTE x 3 years		Support project implementation of Activities 1, 2, and 3.			30%	0.75	X	\$59,000
							Sub Total	\$230,200
Contracts and Services								
Hawk Ridge Bird Observatory	Service Contract	Hawk Ridge will be helping to coordinate kestrel project Activities 1, 2, and 3 in the Duluth area. Specific contributions of the team include nest box monitoring and maintenance, weighing/banding birds, sample collection (blood/fecal), and outfitting birds with tracking tags.				0		\$45,000
Mark Martell (Independent Contractor)	Service Contract	Raptor expert providing assistance with Activities 1, 2, and 3. Weighing and banding kestrels, collecting fecal samples, and attaching tracking tags.				0		\$30,000
University of Minnesota Raptor Center	Service Contract	Staff from the U of M Raptor Center will be assisting with Activities 1, 2, and 3 in the Twin Cities area. Specific contributions include weighing/banding birds, sample collection (blood/fecal), and outfitting birds with tracking tags.				0		\$10,000
TBD	Service Contract	Lab analysis of environmental samples for pesticide presence.				0		\$30,000
TBD	Service Contract	DNA Metabarcoding testing of fecal samples to create diet profile.				0		\$20,000
TBD	Service Contract	Bloodwork testing to determine kestrel health and/or rodenticide/pesticide presence testing of kestrel blood or prey item.				0		\$15,000

							Sub Total	\$150,000
Equipment, Tools, and Supplies								
	Tools and Supplies	Purchase of nest boxes, posts, and wood shavings, plus installation costs	Install additional 15 to 25 nest boxes in areas with varying agricultural impact. Will complement ~60 nest boxes already installed in other areas.					\$5,700
	Tools and Supplies	Field supplies, including items such as ladders, telescoping cameras, nets, field GPS, plus supplies for fecal, pesticide, and blood sample collection - gloves, vials, measurement tools, syringes, etc.	Supplies needed to conduct fieldwork on kestrels, including items for monitoring nest boxes, assessing health status, collecting samples, and catching birds to attach tracking tags.					\$5,000
	Tools and Supplies	Nest box cameras and attachments - est. \$350/unit x 10, plus sd cards and batteries	Attach cameras on or near a sample of nest boxes to document prey items being brought back to feed young.					\$4,000
	Tools and Supplies	GPS and Hybrid Motus tags for tracking minimum of 50 kestrels, plus nodes for tracking fine-scale movements.	Intending to use a mix of GPS tags (~\$2000/unit plus \$60 data plan per unit) and new CTT (Cellular Tracking Technologies) Blubird hybrid Motus tags (~\$350/unit including data plan) to track kestrels locally and through their southern migration. In addition, specialized CTT receiver nodes (\$400 ea.) and antenna kits (\$700 ea.) can be set up to track fine-scale movements of kestrels across their hunting grounds.					\$50,000
							Sub Total	\$64,700
Capital Equipment								
							Sub Total	-
Acquisitions and Stewardship								
							Sub Total	-
Travel In Minnesota								

	Miles/ Meals/ Lodging	In-state fuel, meals, and accommodation associated with fieldwork for Activities 1, 2, and 3: \$1200/yr for 3 years. Anticipate one week of overnight travel per year and multiple day trips per week from spring through mid summer. Reimbursement rates as allotted per the State of Minnesota travel regulations.	Travel to field sites in Minnesota to complete Activities 1, 2, and 3.					\$3,600
							Sub Total	\$3,600
Travel Outside Minnesota								
							Sub Total	-
Printing and Publication								
							Sub Total	-
Other Expenses								
		Shipping and packaging	Costs associated with shipping and packaging samples to send to laboratories for diet, health, and pesticide analyses.					\$500
							Sub Total	\$500
							Grand Total	\$449,000

Classified Staff or Generally Ineligible Expenses

Category/Name	Subcategory or Type	Description	Justification Ineligible Expense or Classified Staff Request
<p>Personnel - Biologist and Project Manager: average 0.4 FTE x 3 years</p>		<p>Overall coordination of project activities. Assist with implementation of Activities 1, 2, and 3.</p>	<p>Classified : A classified staff position will be partially supported by these ENRTF funds. This staff member will have the necessary expertise required to successfully implement all three activities in the proposal. 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.</p>
<p>Personnel - Natural Resources Technician or similar: average 0.25 FTE x 3 years</p>		<p>Support project implementation of Activities 1, 2, and 3.</p>	<p>Classified : A classified staff position will be partially supported by these ENRTF funds. This staff member will have the necessary expertise required to assist with Activities 1, 2, and 3. 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.</p>

Non ENRTF Funds

Category	Specific Source	Use	Status	Amount
State				
In-Kind	Minnesota Zoo's general operating budget	Administrative costs, utilities and other expenses associated with implementation of activities, estimated at 15% of the total request	Secured	\$67,350
			State Sub Total	\$67,350
Non-State				
			Non State Sub Total	-
			Funds Total	\$67,350

Total Project Cost: \$516,350

This amount accurately reflects total project cost?

Yes

Attachments

Required Attachments

Visual Component

File: [0db2796d-cf7.pdf](#)

Alternate Text for Visual Component

The graphic is a compilation of photographs of American kestrels used to illustrate the different activities of the proposal. This includes nest box monitoring, creating a diet profile, pesticide sampling, and tracking movements. The graphic also includes logos of partner organizations....

Supplemental Attachments

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

Title	File
Three Rivers Park District Letter of Support	e2d3072d-e49.pdf
The Raptor Center Letter of Support	0fcf2a35-4d5.pdf
Hawk Ridge Letter of Support	b9e336de-d54.pdf
Audubon Upper Mississippi Letter of Support	7a7e5f44-549.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

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