Environment and Natural Resources Trust Fund

2022 Request for Proposal

General Information

Proposal ID: 2022-123

Proposal Title: Bobcat and Fisher Habitat Use and Interactions

Project Manager Information

Name: Michael Joyce

Organization: U of MN - Duluth - NRRI

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Project Basic Information

Project Summary: We will describe habitat use, diet, and activity patterns of bobcats and fishers to understand why bobcats kill female fishers and identify potential solutions to reverse the fisher population decline.

Funds Requested: $447,000

Proposed Project Completion: June 30 2025

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): Central, NE, NW,

What is the best scale to describe the area impacted by your work?

Region(s): Central, NE, NW,

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.

Fishers and bobcats are native carnivores that live in the forested region of Minnesota. The fisher population in Minnesota has declined by 50% over the past 20 years.

A Minnesota DNR fisher study identified two potential causes of the fisher population decline: 1) Limited availability of large-diameter cavity trees to support reproduction, and 2) High rates of predation on fishers, mainly by bobcats. With respect to predation, the relevant results of the DNR study include:

- 21 of 26 fishers killed by predators in Minnesota were females, including 20 adult females
- 15 adult female fishers were killed while caring for dependent kits, resulting in loss of all 15 litters
- Bobcats are the primary predator of female fishers in Minnesota

One potential reason bobcats are killing female fishers is that the bobcat population has more than doubled in the past 20 years. The high rates of predation on female fishers documented by the DNR project are not sustainable. Understanding why bobcats kill fishers will help to identify management solutions to reverse the fisher population decline.

There has not been an in-depth study on bobcats in Minnesota since the early 1980s, and data on bobcat ecology would enhance bobcat management in Minnesota.

What is your proposed solution to the problem or opportunity discussed above? i.e. What are you seeking funding to do? You will be asked to expand on this in Activities and Milestones.

This proposal is part of a larger effort to improve fisher management in Minnesota. The ENRTF-funded fisher den box project is currently addressing cavity availability. The main objective of this project is to use data on fisher and bobcat habitat use, activity patterns, and diets to learn why female fishers are being killed by bobcats. Understanding why female fishers are vulnerable to being killed by bobcats will allow us to identify potential solutions that would help reverse the fisher population decline.

We will deploy GPS collars on bobcats and fishers in Minnesota to:

- Determine habitat use and activity patterns of bobcats and fishers
- Identify habitats where bobcats and fishers are likely to come into contact
- Collect prey and diet data to measure diet overlap and competition for prey
- Evaluate factors contributing to the bobcat population increase over the last 20 years

In addition to identifying potential solutions to reverse the fisher population decline, this project will also update our knowledge of bobcat ecology in Minnesota. We will collect data on bobcat diets, activity patterns, habitat selection, home range sizes, and survival, which will enhance bobcat management in Minnesota.

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 generate foundational data that the DNR can use to manage fisher and bobcat populations in Minnesota. GPS data on fine-scale habitat use by fishers and bobcats has never been collected in Minnesota. Data from this project is needed to understanding why bobcats are killing fishers and for developing management strategies to maintain healthy populations of both species. The last bobcat study in Minnesota was conducted almost 40 years ago, long before the bobcat population increased. This project will update knowledge of bobcat ecology in Minnesota. Additionally, both species are charismatic species of high value to the public.

Activities and Milestones

Activity 1: Determine habitat use, diets, and activity patterns of bobcats and fishers to inform management options

Activity Budget: $447,000

Activity Description:
We will capture and deploy GPS collars on 24 bobcats and 28 female fishers in two study areas where previous fisher research has taken place. We will use GPS location data from study animals to describe fine-scale habitat use and identify areas where fishers are vulnerable to predation by bobcats. Locations will also be used to identify and to monitor reproductive dens used by fishers and bobcats, and to determine why bobcats kill fishers during the breeding season. We will collect data on bobcat and fisher diets and prey availability to measure prey competition between bobcats and fishers. We will summarize home range sizes and overlap, survival and causes of mortality, and activity patterns of bobcats and fishers we radiocollar. Lastly, we will use existing data on bobcat and fisher harvests from the DNR and historical forest change data to identify changes in bobcat and fisher distribution over time and determine the role of forest change in recent population trends. We will disseminate results of our study to other researchers and wildlife managers and members of the public throughout the study via an informational website, public-oriented webinars and presentations, and presentations at local and state meetings with natural resource professionals.

Activity Milestones:

Description	Completion Date
Deploy GPS collars on fishers and bobcats over 2 capture seasons	February 28 2024
Monitor habitat use to identify areas where bobcats and fishers encounter each other	March 31 2025
Collect and analyze diet samples from radio-collared bobcats and fishers	March 31 2025
Finalize analyses of habitat use, diets, and activity patterns and submit final reports	June 30 2025

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Dr. Michael Joyce	UMD-NRRI	Project manager who will design, implement, and oversee all aspects of this project including live-capture of study animals, field monitoring, and data management and analysis.	Yes
Dr. Ron Moen	UMD-NRRI	Co-investigator who will provide input and assistant to Dr. Joyce on all aspects of this project.	Yes
Dr. Roger Powell	North Carolina State University (retired; lives in Ely, MN)	Will provide input and in-kind support on the project, including field work, data-analysis, and writing.	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 be funded?

This proposal is part of a larger effort to understand fisher ecology in Minnesota. This project will build off the results of the DNR fisher project and complement our ongoing fisher den box project that was funded by the ENRTF last year. Radio-collaring female fishers near den boxes will provide additional data to understand factors influencing whether fishers use den boxes, while information on where fishers are vulnerable to predation by bobcats will help guide future fisher den box deployments. Data on bobcat ecology will be used to inform bobcat management and future bobcat research in Minnesota.

Other ENRTF Appropriations Awarded in the Last Six Years

Name	Appropriation	Amount Awarded
Den Boxes for Fishers and other Nesting Wildlife	M.L. 2019, First Special Session, Chp. 4, Art. 2, Sec. 2, Subd. 03i	$190,000

Project Manager and Organization Qualifications

Project Manager Name: Michael Joyce

Job Title: Wildlife Ecologist/Researcher 5

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

Dr. Joyce is a Wildlife Ecologist at the Natural Resources Research Institute, University of Minnesota-Duluth. He has over 10 years of wildlife research experience on telemetry and habitat analyses using LiDAR and other spatial data. Michael is currently managing one ENRTF-funded project (2019 Den boxes for fishers and other cavity-nesting wildlife). He has worked extensively on wildlife research projects in northern Minnesota over the last 10 years.

EDUCATION:
PhD, 2018. University of Minnesota, Integrated Biological Sciences.
MS, 2013. University of Minnesota, Integrated Biological Sciences.
BS, 2008. University of Wisconsin-Madison, Molecular Biology.

Dr. Moen is a Wildlife Ecologist at the Natural Resources Research Institute, University of Minnesota Duluth. He has over

25 years of research experience focusing on mammals, GPS telemetry, and wildlife ecology.

EDUCATION:
PhD, 1995. University of Minnesota, Wildlife Conservation.
MS, 1988. University of Minnesota, Wildlife. Plant Physiology Minor.
BS, 1984. Cornell University, Division of Biological Sciences.

RECENT PUBLICATIONS (directly related to carnivore ecology, habitat use, and movements):
Joyce, M., J. Erb, P. Coy, B. Sampson, R. Moen. (in revision). Age- and sex-specific dispersal in a harvested population of American martens. Submitted to Journal of Mammalogy.

Joyce, M., J. Erb, B. Sampson, R. Moen. 2019. Detection of coarse woody debris using airborne light detection and ranging (LiDAR). Forest Ecology and Management 433 (pp 678-689).

Joyce, M., A. Zalewski, J. Erb, R. Moen. (2017). Use of resting microsites by members of the Martes Complex: the role of thermal stress across species and regions. The Martes complex in the 21st Century: Ecology and Conservation (pp. 181-220).

Green, R., M. Joyce, S. Matthews, K. Purcell, J. Higley, A. Zalewski. (2017). Guidelines and techniques for studying the reproductive ecology of wild fishers, American martens, and other members of the Martes complex. The Martes complex in the 21st Century: Ecology and Conservation (pp. 313-358)

Organization: U of MN - Duluth - NRRI

Organization Description:
The Natural Resources Research Institute (NRRI) is a part of the University of Minnesota Duluth and employs over 130 scientists, engineers and technicians. Its mission is to deliver integrated research solutions that value our resources, environment and economy for a sustainable and resilient future.

NRRI collaborates broadly across the University system, the state and the region to address the challenges of a natural resource-based economy.

By partnering with industry, business leaders, agency decision-makers and many others, NRRI researchers frame and deliver on real-world solutions. NRRI scientists have extensive experience in managing large, interdisciplinary projects. Major objectives include the development of tools for environmental assessment and resource management. NRRI's role is as an impartial, science-based resource that develops and translates knowledge by characterizing and defining value-resource opportunities, minimizing waste and environmental impact, maximizing value from natural resource utilization and maintaining/restoring ecosystem function.

Major outcomes from NRRI projects include informing environmental management and policy and assisting industry and communities in defining and maintaining the social license to operate in natural systems. NRRI has an established mechanism for sharing outcomes through press releases, publication in peer-reviewed journals, annual reports, periodicals, and through social media channels.

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	$ Amount
Personnel								
Michael Joyce		Project Manager/Principal Investigator			26.7%	1.38		$121,476
Ron Moen		Co-investigator			26.7%	0.12		$21,483
TBD, Graduate Student		Complete graduate thesis working on project			49.4%	0.5		$41,739
Undergraduate research assistant		Help conduct field, lab, and office work to support project			0%	1.5		$37,440
Technician		Help collect and analyze data			24.1%	1.26		$70,743
							Sub Total	**$292,881**
Contracts and Services								
TBD	Professional or Technical Service Contract	Analysis of diet composition at stable isotope laboratory (172 samples @ $16 per sample).				0.12		$2,752
TBD	Professional or Technical Service Contract	GPS data downloads for fisher GPS collars.				0.09		$8,640
							Sub Total	**$11,392**
Equipment, Tools, and Supplies								
	Equipment	GPS collars (24 bobcat collars @ $1,750 each + 28 fisher collars @ $1,500 each)	To collect movement and habitat selection data for bobcats and fishers					$84,000
	Equipment	GPS antenna for fisher collars	Allows us to download fisher locations remotely from the field					$175
	Tools and Supplies	Live capture supplies (bobcat traps: 36 @ $27 each; ear tags, syringes, drugs, sample bags, lure, bait, batteries, etc.)	For live-trapping bobcats and fishers to deploy GPS collars; costs also cover prey surveys					$1,976
	Tools and Supplies	Equipment and supplies to monitor study animals (Remote cameras: 88 @ $175 each; Temperature	For monitoring GPS-collared bobcats and fishers at reproductive dens and					$21,576

		data loggers: 48 @ $59/logger; SD cards and lithium batteries for trail cameras)	for monitoring weather conditions across both study areas					
							Sub Total	**$107,727**
Capital Expenditures								
							Sub Total	**-**
Acquisitions and Stewardship								
							Sub Total	**-**
Travel In Minnesota								
	Miles/ Meals/ Lodging	Travel for field work on prey surveys, live-capture, and monitoring study animals including mileage (75%) and lodging for technician, PI, and graduate student. Mileage will be reimbursed at $0.56/mile (MN state rate).	Capture and collar bobcats and fishers, monitor study animals, and collect other field data.					$35,000
							Sub Total	**$35,000**
Travel Outside Minnesota								
							Sub Total	**-**
Printing and Publication								
							Sub Total	**-**
Other Expenses								
							Sub Total	**-**
							Grand Total	**$447,000**

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				
In-Kind	UMN unrecovered indirect costs are calculated at the UMN negotiated rate for research of 55% modified total direct costs.	Indirect costs are those costs incurred for common or joint objectives that cannot be readily identified with a specific sponsored program or institutional activity. Examples include utilities, building maintenance, clerical salaries, and general supplies. (https://research.umn.edu/units/oca/fa-costs/direct-indirect-costs)	Secured	$236,816
			Non State Sub Total	**$236,816**
			Funds Total	**$236,816**

Attachments

Required Attachments

Visual Component

File: 7316f3f8-41b.pdf

Alternate Text for Visual Component

Maps showing distribution of harvest for bobcats and fishers, graphs of population trends for bobcats and fishers from 1977 through 2017, and pictures of each species....

Optional Attachments

Support Letter or Other

Title	File
UMD Sponsored Projects Transmittal Letter	51721577-349.pdf
Letter of Support from Dr. Roger Powell	eb740b3b-285.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

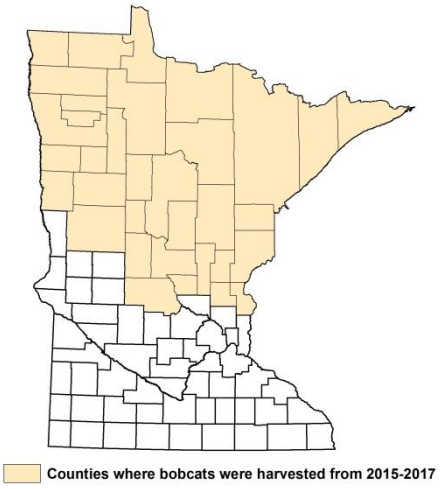
Does the organization have a fiscal agent for this project?

Yes, Sponsored Projects Administration

Bobcat and fisher habitat use and interactions: Why do Bobcats Kill Fishers?

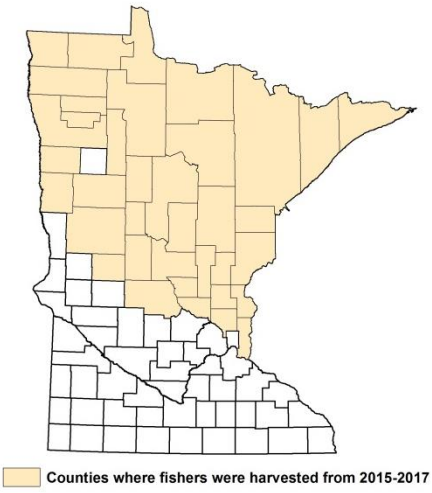
Bobcats in Minnesota

Distribution of Bobcat Harvest

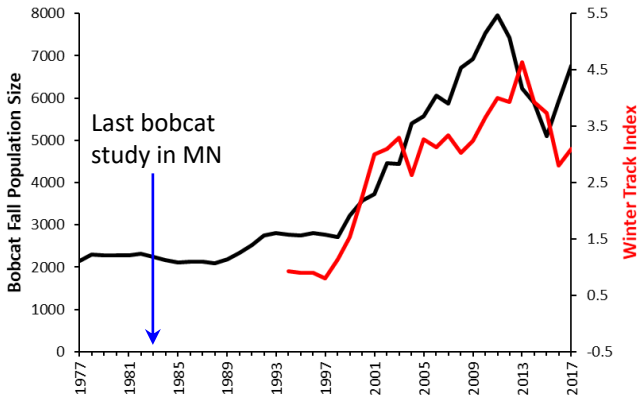


Fishers in Minnesota

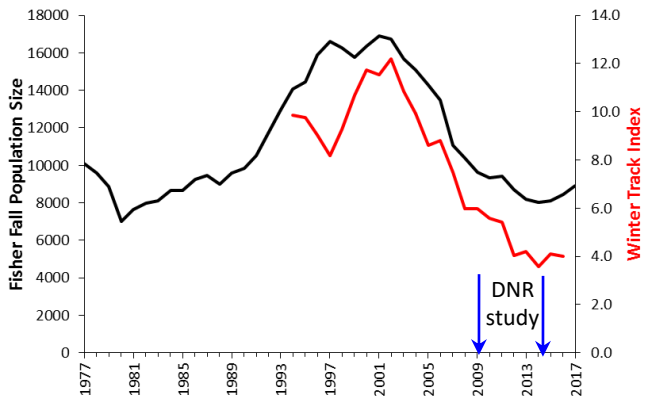
Distribution of Fisher Harvest



The bobcat population increased over 20 years



The fisher population declined 50% over 20 years



Bobcat at a fisher reproductive den in Minnesota

Fisher in Minnesota

Project Outcome: Foundational data on bobcat and fisher habitat use, diets, and activity patterns that will be used to develop management plans to reverse the fisher population decline and promote healthy populations of both species