Environment and Natural Resources Trust Fund
2020 Request for Proposals (RFP)

Project Title: **ENRTF ID: 019-A**

Bobcat and Fisher Habitat Use and Interactions

Category: A. Foundational Natural Resource Data and Information

Sub-Category:

Total Project Budget: $ 440,719

Proposed Project Time Period for the Funding Requested: June 30, 2023 (3 yrs)

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.

Name: Michael Joyce

Sponsoring Organization: U of MN

Job Title: Dr.

Department: Natural Resources Research Institute

Address: 5013 Miller Trunk Highway

Duluth MN 55811

Telephone Number: (218) 788-2656

Email joyc0073@d.umn.edu

Web Address:

Location:

Region: Central, Metro, Northwest, Northeast

County Name: Aitkin, Anoka, Becker, Benton, Carlton, Cass, Chisago, Clay, Clearwater, Cook, Crow Wing, Douglas, Hubbard, Isanti, Itasca, Kanabec, Kittson, Koochiching, Lake, Lake of the Woods, Mahnomen, Marshall, Mille Lacs, Morrison, Norman, Otter Tail, Pennington, P

City / Township:

Alternate Text for Visual:

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

_____ Funding Priorities	_____ Multiple Benefits	_____ Outcomes	_____ Knowledge Base
_____ Extent of Impact	_____ Innovation	_____ Scientific/Tech Basis	_____ Urgency
_____ Capacity Readiness	_____ Leverage	_____ TOTAL	_____%

PROJECT TITLE: Bobcat and fisher habitat use and interactions

I. PROJECT STATEMENT

Fishers and bobcats are native carnivores that live in the forested region of Minnesota. Minnesota DNR data shows that over the last 20 years the fisher population has declined by about 50%. Dr. John Erb (furbearer biologist, MN DNR) radiocollared fishers from 2008 to 2015 and identified two potential causes of the fisher population decline in Minnesota:

Cause 1: Limited availability of large-diameter cavity trees to support female fisher reproduction, and
Cause 2: High rates of predation on fishers, mainly by bobcats

To address Cause 1, the DNR supported the fisher den box proposal that we submitted to the LCCMR in 2018, and that project was recommended for funding (032-AH Den Boxes for Fishers and Other Nesting Wildlife). That project will start on July 1, 2019.

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 so vulnerable to being killed by bobcats, addressing Cause 2 for the fisher population decline. We used results of the DNR study and discussions with Dr. Erb to design our project. 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 reason for bobcat predation being important is that the bobcat population has more than doubled over the past 20 years while the fisher population has declined by 50% (See map page). The high rates of predation on female fishers documented by the DNR project are not sustainable. Understanding bobcat biology and why bobcats kill fishers will help to explain why the fisher population has declined and will help to identify management solutions to reverse the fisher population decline.

The increase in the bobcat population is one obvious reason why bobcats would be killing fishers at high rates. Understanding why the bobcat population has increased will benefit management of both fishers and bobcats. The recent DNR project on fishers updated knowledge of the fisher population, but the last bobcat study in Minnesota was conducted almost 40 years ago, long before the bobcat population increased (see figure on map page).

> **In addition to providing valuable information on the declining fisher population, our proposed project will also generate important information beneficial to management of bobcats, such as home range sizes, activity patterns, habitat use, and diet.**

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. This proposal is part of a larger effort to aid fisher management in Minnesota. 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

II. PROJECT ACTIVITIES AND OUTCOMES

Activity 1: Determine habitat use, diets, and activity patterns of bobcats and fishers to inform management options **Budget: $440,719**

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.

Outcome	Completion Date
1. Deploy GPS collars on fishers and bobcats over 2 capture seasons	*February 2022*
2. Monitor habitat use to identify areas where bobcats and fishers encounter each other	*March 2023*
3. Collect and analyze diet samples from radiocollared bobcats and fishers	*March 2023*
4. Finalize analyses of habitat use, diets, and activity patterns and submit final reports	*June 2023*

III. PROJECT PARTNERS

Dr. Michael Joyce (NRRI-UMD) is overall project manager and will design and implement all aspects of this project including live-capture of study animals, field-monitoring, and data management and analysis.

Dr. Ron Moen (NRRI-UMD) will provide input and assistance to Dr. Joyce on all aspects of this project.

Dr. John Erb (MN DNR) will provide input and in-kind support on this project, with intent to use results to help inform fisher and bobcat management

Dr. Roger Powell (North Carolina State Univ.) will provide input and in-kind support on this project

IV. LONG-TERM-IMPLEMENTATION AND FUNDING:

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 recommended for funding by LCCMR 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.

The bobcat population increase is a management success story, but it appears to have come at a cost to fishers. Data on fine-scale habitat use and diets of bobcats and fishers in the same area are important for understanding why bobcats are killing fishers and for developing management strategies to promote the fisher population while maintaining a healthy bobcat population in Minnesota.

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, and this project will generate valuable data on bobcats that has not been collected in Minnesota for >35 years.

TIMELINE REQUIREMENTS

This project would require three years of ENRTF funding from 7/1/2020 to 6/30/2023. We will focus live-capture and radiocollaring efforts during the first two years of the study, and we will monitor study animals for all three years. We will focus on field data collection during the first 2.5 years and complete analyses and reporting during the final 0.5 year.

Attachment A: Project Budget Spreadsheet
Environment and Natural Resources Trust Fund
M.L. 2020 Budget Spreadsheet
Legal Citation:
Project Manager: Dr. Michael Joyce
Project Title: Bobcat and fisher habitat use and interactions
Organization: U of MN - Duluth (NRRI)
Project Budget: $440,719
Project Length and Completion Date: 3 years, June 30, 2023
Today's Date: April 8, 2019

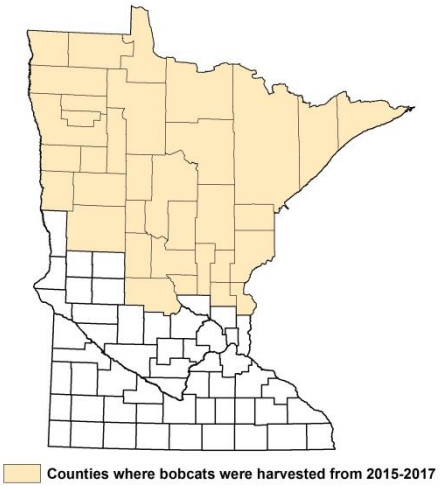
ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET	Budget	Amount Spent	Balance
BUDGET ITEM			
Personnel (Wages and Benefits)	$ 287,001	$ -	$ 287,001
Michael Joyce, Project Manager: $118,958 (74% salary, 26% fringe), ~46% FTE for 3 years;			
Ron Moen, Principal Investigator: $20,957 (74% salary, 26% fringe), 4.2% FTE for 3 years;			
Technician: $69,508 (77% salary, 23% fringe), 50% FTE for 2 years + 25% FTE for 1 year;			
Graduate research assistant: $40,138 (86% salary, 14% fringe), 50% FTE for 1 year;			
Undergraduate research assistant: $37,400 (100% salary, 0% fringe), 50% FTE for 3 years			
**Note that NRRI research staff salaries are largely sponsored by external funding sources*			
Professional/Technical/Service Contracts			
Analysis of diet composition at stable isotope laboratory (172 samples @ $16 per sample)	$ 2,752	$ -	$ 2,752
GPS data downloads for bobcat collars	$ 8,640	$ -	$ 8,640
Equipment/Tools/Supplies			
GPS collars (24 bobcat collars @ $1,750 per collar + 28 fisher collars @ $1,500 per collar)	$ 84,000	$ -	$ 84,000
Traps for bobcats and supplies for live-capture of bobcats and fishers.	$ 1,575	$ -	$ 1,575
Equipment and supplies to monitor study animals (trail cameras, batteries and SD cards, temperature loggers, antenna to remotely download data from GPS collars.	$ 21,751	$ -	$ 21,751
Travel expenses in Minnesota			
Travel for fieldwork (live-capture, monitoring, prey surveys), including mileage (75%) and lodging for technician, PI, graduate student, and undergraduate field assistant. Mileage will be reimbursed at $0.58/mile (MN state rate). Lodging is estimated between $90 and $110 per night, less if camping is possible.	$ 35,000	$ -	$ 35,000
COLUMN TOTAL	$ 440,719	$ -	$ 440,719

SOURCE AND USE OF OTHER FUNDS CONTRIBUTED TO THE PROJECT	Status (secured or pending)	Budget	Spent	Balance
Non-State:		$ -	$ -	$ -
State:		$ -	$ -	$ -
In kind:			$ -	$ -
Unrecovered indirect: 54% on total direct costs	secured	$ 229,354		
DNR will provide in-kind support to capture and monitor study animals near Grand Rapids. Value of support unknown at this time.	pending	$ -		
Other ENRTF APPROPRIATIONS AWARDED IN THE LAST SIX YEARS	**Amount legally obligated but not yet spent**	**Budget**	**Spent**	**Balance**
032-AH Artificial Den Boxes for Fishers and Other Nesting Wildlife (recommended for FY2019)		$ 190,000	$ -	$ 190,000

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

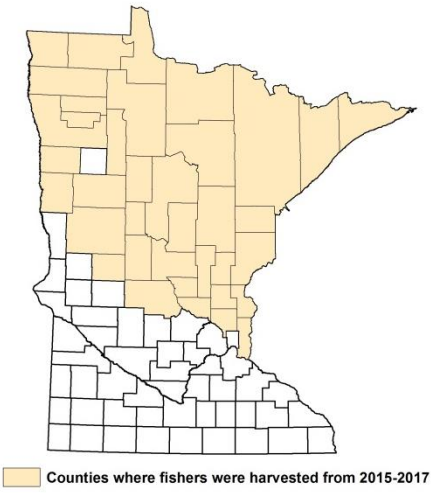
Bobcats in Minnesota

Distribution of Bobcat Harvest

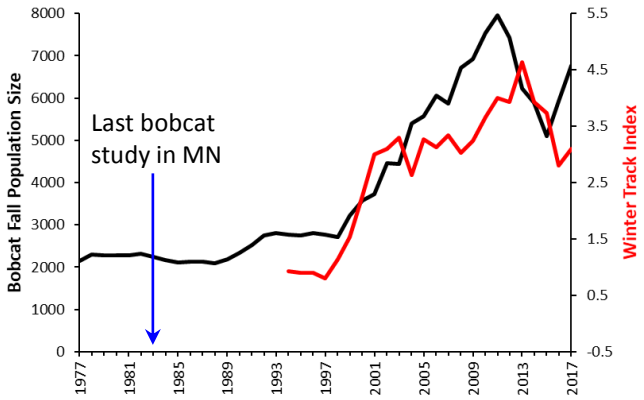


Fishers in Minnesota

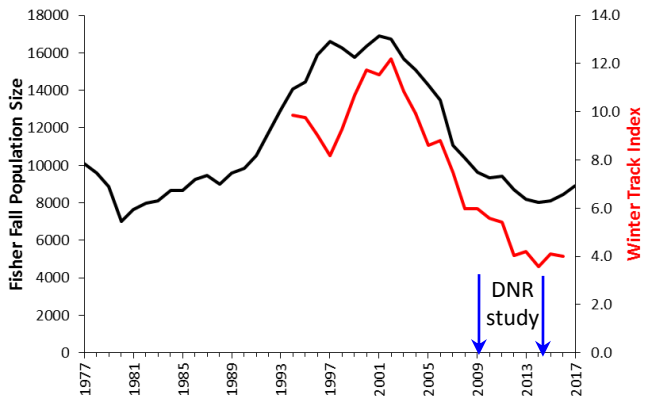
Distribution of Fisher Harvest



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.

PROJECT TITLE: Bobcat and fisher habitat use and interactions

Dr. Michael Joyce, Natural Resources Research Institute, University of Minnesota Duluth

Key Qualifications: Michael is a Wildlife Ecologist at the Natural Resources Research Institute, University of Minnesota Duluth. He has ~8 years of research experience on telemetry and habitat analyses using LiDAR data. Michael has worked on several projects at NRRI as a graduate student, and has also worked extensively with Dr. John Erb, the MN DNR furbearer biologist, on past research on fishers and martens.

EDUCATION:

Ph.D., 2018. University of Minnesota, Integrated Biological Sciences.
M.S., 2013. University of Minnesota, Integrated Biological Sciences.
B.A., 2008. University of Wisconsin-Madison, Molecular Biology.

Dr. Ron Moen, Natural Resources Research Institute, University of Minnesota Duluth

Key Qualifications: Ron is a Wildlife Ecologist and Research Lab Manager 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:

Ph.D., 1995. University of Minnesota, Wildlife Conservation.
M.S., 1988. University of Minnesota, Wildlife. Plant Physiology Minor.
B.S., 1984. Cornell University, Division of Biological Sciences.

RELEVANT RESEARCH EXPERIENCE:

Dr. Moen has worked on and managed research projects on many different species while at NRRI, with over $4 million of research projects funded. Dr. Joyce has worked on several of these projects as a graduate student with Dr. Moen as his advisor. After receiving his Ph.D. in Fall 2018, Dr. Joyce began managing the 2019 LCCMR recommended project on fisher den boxes. Dr. Joyce's other relevant experience includes his M.S. and Ph.D. projects on marten habitat requirements and extensive field work and data analysis on the MN DNR marten and fisher project led by Dr. John Erb.

PUBLICATIONS (Directly related to fisher research):

Joyce, M. J., Zalewski, A., Erb, J., & Moen, R. A. (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., Joyce, M.J., Matthews, S., Purcell, K., Higley, J., & Zalewski, A. (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 DESCRIPTION

The Natural Resources Research Institute is a University of Minnesota Duluth applied research organization. NRRI's mission is to deliver research solutions to balance Minnesota's economy, resources and environment for resilient communities.