

**Environment and Natural Resources Trust Fund  
2019 Request for Proposals (RFP)**

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**Project Title:**

**ENRTF ID: 030-AH**

City Bats and Country Bats - Whats the difference?

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**Category:** H. Proposals seeking \$200,000 or less in funding

**Sub-Category:** A. Foundational Natural Resource Data and Information

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**Total Project Budget: \$** 200,000

**Proposed Project Time Period for the Funding Requested:** June 30, 2021 (2 yrs)

**Summary:**

Urban and suburban bat populations may be larger than generally thought. We will use acoustic detectors and telemetry to improve knowledge about bat populations and benefits to human society.

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**Name:** Ron Moen

**Sponsoring Organization:** U of MN - Duluth

**Title:** Associate Professor and Senior Research Associate

**Department:** Natural Resources Research Institute

**Address:** 5013 Miller Trunk Hwy  
Duluth MN 55811-1442

**Telephone Number:** (218) 788-2610

**Email** rmoen@d.umn.edu

**Web Address**

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**Location**

**Region:** Central, Metro, Northwest, Northeast, Southeast

**County Name:** Anoka, Blue Earth, Carver, Cook, Dakota, Hennepin, Hubbard, Itasca, Koochiching, Le Sueur, Nicollet, Olmsted, Ramsey, Scott, St. Louis, Stearns

**City / Township:**

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**Alternate Text for Visual:**

Acoustic detector sites in Minnesota mapped, picture of detector and bat calls, picture of mist net and bat with radiotransmitter. Map of bat movements between roosts each night.

<input type="checkbox"/>	Funding Priorities	<input type="checkbox"/>	Multiple Benefits	<input type="checkbox"/>	Outcomes	<input type="checkbox"/>	Knowledge Base
<input type="checkbox"/>	Extent of Impact	<input type="checkbox"/>	Innovation	<input type="checkbox"/>	Scientific/Tech Basis	<input type="checkbox"/>	Urgency
<input type="checkbox"/>	Capacity Readiness	<input type="checkbox"/>	Leverage	<input type="checkbox"/>		TOTAL	<input type="checkbox"/> %
<input type="checkbox"/> If under \$200,000, waive presentation?							



**PROJECT TITLE: City bats and Country bats – What's the difference?**

**I. PROJECT STATEMENT**

In a previous ENRTF project, "Endangered bats, White-Nose Syndrome, and Forest Management (M.L. 2015, Chp. 76, Sec. 2, Subd. 03i)," we studied the habitat use of northern long-eared bats. We focused on that species because 95% or more of the northern long-eared bats in winter hibernacula in the eastern U.S. have died since White Nose Syndrome (WNS) appeared in 2006. Bats started dying from WNS in Minnesota in 2016.

**It is hard to imagine a 95% population decline in a species—Moose declined by 50% in MN since 2008  
In human terms, imagine only 5,000 people left in Duluth or in Rochester!**

The northern long-eared bat was listed as threatened under the Endangered Species Act because of population declines due to WNS, and because too little was known about the possible effect of forest harvest on northern long-eared bat reproduction. Gaining knowledge from the ENRTF project made it possible to use data from bats in Minnesota to identify positive and negative effects of possible restrictions on forest harvest.

We used mist-netting, VHF transmitters, and acoustic detection to identify summer roosting habitat for the northern long-eared bat in Minnesota forests. During that study, we learned some other information about Minnesota's bats:

1. Most bats roosted within 1,000 yards of where they were captured each night.
2. We detected bats in over 95% of locations where detectors were deployed.
3. 5 or more bat species were present at 157 of 216 (72%) of acoustic detector sites.
4. Bats are active in Minnesota from early May to early October.
5. At 9 sites by water bodies, we had almost 1.5 times as many calls / night as at 207 sites on land.

Collectively, this means that bats are using roads, trails, powerlines, and other linear corridors nearly everywhere across the forested area of MN in the summer. About half of our sampling was in rural or wild areas with < 1 person / mi<sup>2</sup>. In acoustic sampling at 24 sites in urban and suburban areas near Duluth with more than 80 people / mi<sup>2</sup>, different patterns emerge:

1. There were 3 to 4 times more calls per night from silver-haired and big brown bats.
2. There were half as many calls per night by *Myotis* bats (Little brown bat and northern long-eared bat).
3. Overall, there were 66 calls /night with < 1 person / mi<sup>2</sup>, and 247 calls / night with > 80 people / mi<sup>2</sup>.

The effort in the current ENRTF project was in forests by design, yet from the small sample size we have it appears that urban and suburban areas could be used by bats more intensively than forested areas (see map page). It also appears that water bodies like lakes and ponds also would have a higher density of bats feeding, although bats would still need trees, buildings, and bridges to roost each night.

**This leads to the specific goals of this proposal for bats in MN:**

- 1. Deploy bat detectors in a subset of urban, suburban, and water habitats;**
- 2. Determine foraging distances for urban and suburban bats from VHF telemetry;**
- 3. Calculate the number of bats that would be needed to make calls at detectors;**
- 4. Extend this to relative bat densities and ecosystem services provided by bats each year.**

The outcome of this project would be an improved understanding of biological and economic benefits of bats for Minnesota. Specific outcomes of this project would include:

- 1. Biological: Better idea about how bats are functioning in our Minnesota ecosystems;**
- 2. Management: Identification of habitats and areas used by bats in urban and suburban areas;**
- 3. Legal: Knowledge is power, enabling biologically-based responses instead of extreme solutions;**
- 4. Economic: Quantifying benefits of bats enables estimates of return on investment for management.**



**II. PROJECT ACTIVITIES AND OUTCOMES**

**Activity 1: Determine effects of bats and other species**

Bats are surveyed by recording and analyzing their “sonar” calls. We will use existing bat survey data and new surveys to collect recordings of bat sonar calls focused on urban and suburban areas. Trapping and radio-tagging bats in urban and suburban areas will complement the previous ENRTF project on forest bats. Female bats will be captured at these sites, equipped with radio transmitters, and tracked to roost sites and maternity colonies. We will use existing literature, results of current analyses, and analysis of bat dung to identify insect species that are eaten by bats. Colony and roost size will be monitored during the critical reproductive period. Roosts, colony trees, and stands identified will be ecologically characterized using methods from ENRTF project M.L. 2015, Chp. 76, Sec. 2, Subd. 03i. Radio tracking data will be used to estimate foraging radius and home range sizes.

**ENTF BUDGET: \$200,000**

<b>Outcome</b>	<b>Completion Date</b>
1. Determine bat use of urban, suburban, and water areas relative to forested areas	6/30/2021
2. Protocol to calculate consumption of different pest species	6/30/2021
3. Estimate ecosystem service (\$) provided by bats to Minnesota economy	6/30/2021

**III. PROJECT PARTNERS:**

**A. Partners receiving ENRTF funding:** none

**B. Partners NOT receiving ENRTF funding**

<b>Name</b>	<b>Title</b>	<b>Affiliation</b>	<b>Role</b>
Richard Baker	Endangered Species Coordinator	MN DNR	Cooperator

**IV. LONG-TERM IMPLEMENTATION AND FUNDING:**

Our long-term strategy is to develop the ability to estimate the hidden or invisible benefits and costs of the army of animals that we have in MN, using bats as a test species group. Other example species for the future could be mice and moles, as well as larger species like deer and moose. Ultimately, this fits into the concept of knowledge about our natural resources providing power to make the best management decisions, instead of thinking of knowledge as something to fear. Using bats as an example, by understanding how bats benefit humans, and how humans benefit bats, we can develop economic, biological, and social reasons for the management and preservation of our natural resources—even those some people might dislike at first glance.

**V. TIME LINE REQUIREMENTS:**

This project would require 24 months of ENRTF funding from 7/1/2019 to 6/30/2021. We are ready to begin this project with existing equipment and facilities.

## 2019 Proposal Budget Spreadsheet

**Project Title:** City bats and Country bats – What’s the difference?

### IV. TOTAL ENRTF REQUEST BUDGET 2 years

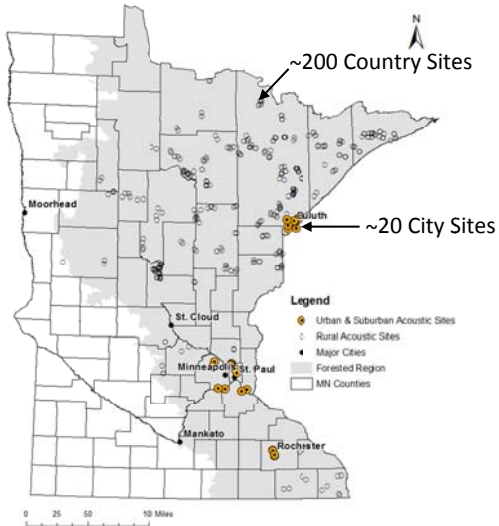
BUDGET ITEM	AMOUNT
<b>Personnel:</b>	<b>\$ 175,500</b>
Ron Moen, Principal Investigator: \$15,875 (fringe rate 33.5%); 5% FTE each year for 2 years	
Morgan Swingen, Field Supervisor, acoustic analysis and data management: \$83,032 (fringe rate 27.2%); 67% FTE each year for 2 years	
Technicians (2) (bat capture and acoustic detector deployment): \$60,619 (fringe rate 27.2%); ~55.3% FTE each year for 2 years	
Undergraduate Research Assistant: \$15,974 (100% salary); 32% FTE each year for 2 years	
<b>Professional/Technical/Service Contracts:</b>	<b>\$ -</b>
<b>Equipment/Tools/Supplies:</b>	<b>\$ 15,000</b>
Supplies (\$15,000): bug spray, mist nets, transmitters, batteries, bat processing supplies	
<b>Acquisition (Fee Title or Permanent Easements):</b>	<b>\$ -</b>
<b>Travel:</b>	<b>\$ 9,500</b>
Travel for fieldwork, including mileage (75%) and lodging for field supervisor, technicians, and undergraduate research assistant. Mileage will be reimbursed at \$0.545/mile (U of M rate). Lodging is estimated between \$90 and \$110 per night, less if camping is possible. Some trips will involve longer-distance travel and require overnight expenses (camping or motel) and food expenses.	
<b>Additional Budget Items:</b>	<b>\$ -</b>
<b>TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND \$ REQUEST =</b>	<b>\$ 200,000</b>

### V. OTHER FUNDS

SOURCE OF FUNDS	AMOUNT	Status
<b>Other Non-State \$ To Be Applied To Project During Project Period:</b>	\$ -	N/A
<b>Other State \$ To Be Applied To Project During Project Period:</b>	\$ -	N/A
<b>In-kind Services To Be Applied To Project During Project Period:</b>		
Unrecovered indirect: 54% on total direct costs (\$200,000 base)	\$ 108,000	Secured
<b>Past and Current ENRTF Appropriation:</b>	\$ 116,334	Unspent
Funds remaining from NRR's portion (\$1,016,054) of M.L. 2015, Chp. 76, Sec. 2, Subd. 03i. (Main PI on project is Richard Baker at MN DNR) Project will be finished 06/30/2018.		
<b>Other Funding History:</b>	\$ 43,500	Secured
"Summer Habitat Use by Bats in Managed Minnesota Forests" funded by National Council for Air and Stream Improvement, Inc. (NCASI). Total project funding: \$38,500. Project dates: 06/08/2015–06/30/2018.		
"Little Brown Bat Telemetry Project at Lake Vermilion-Soudan Underground Mine State Park" funded by MN DNR. Total project funding: \$5,000. Project dates: 06/22/2017–06/30/2017.		

**PROJECT TITLE: City bats and Country bats – What's the difference?**

**Current Project Acoustic Detector Sites**

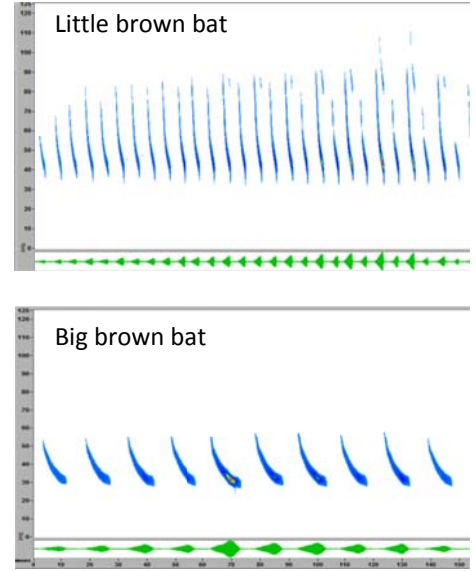


M.L. 2015, Chp. 76, Sec. 2, Subd. 03i  
 Endangered bats, WNS, and Forest Management

**Bat detector on aspen tree**



**Examples of calls from bat detector**



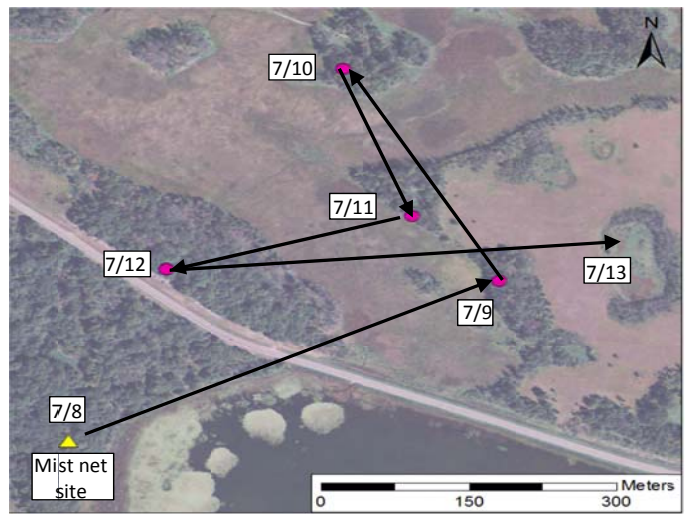
**Setting up a mist net to capture bats**



Big brown bat with transmitter



Roost tree locations used by bat with transmitter over 5 days. Foraging radius is typically less than a mile. We will determine if city bats feed similarly, and estimate insect control services provided by Minnesota bat species.





**Environment and Natural Resources Trust Fund (ENRTF)  
2019 Project Manager Qualifications and Organization Description**

**PROJECT TITLE:** City bats and Country bats – What’s the difference?

**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, 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.

**Morgan Swingen, Natural Resources Research Institute, University of Minnesota Duluth**

**Key Qualifications:** Morgan is a Wildlife Ecologist at the Natural Resources Research Institute, University of Minnesota Duluth. She has worked on several projects at NRRI, including being field and data manager for the current bat project.

**EDUCATION:**

M.S., 2014. North Carolina State University, Fisheries, Wildlife, and Conservation Biology. Statistics Minor.  
B.A., 2010. Minnesota State University Moorhead, Biology. Mathematics and Chemistry Minors.

**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. Morgan has worked on some of these projects since starting at NRRI in 2014. Most relevant to this project is the ENRTF bat research project ending on 6/30/2018 (M.L. 2015, Chp. 76, Sec. 2, Subd. 03i). Working with MN DNR and Superior National Forest Partners, we captured 1204 bats, deployed 117 transmitters, identified 238 roost locations, and deployed acoustic detectors at 216 sites.

**PUBLICATIONS:**

There were 26 Technical reports produced on research of the ENRTF bat project to date, with data analysis for peer-reviewed manuscripts ongoing now. Field work on the project stopped in October 2017.

**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.