

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

Project Title:

ENRTF ID: 035-A

Malaria in Migrant and Resident Birds of Minnesota

Category: A. Foundational Natural Resource Data and Information

Sub-Category:

Total Project Budget: \$ 316,000

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

Summary:

Minnesota birds carry avian malaria, but we do not know how frequently, what kinds, or where they come from. We propose to begin malaria monitoring to fill this knowledge gap.

Name: Keith Barker

Sponsoring Organization: U of MN

Job Title: Dr.

Department: College of Biological Sciences

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St. Paul MN 55108

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Email barke042@umn.edu

Web Address:

Location:

Region: Statewide

County Name: Statewide

City / Township:

Alternate Text for Visual:

Malaria is present in Minnesota, but prevalence (% infected) and strains are unknown! It is also unknown whether Minnesota migrant birds acquire new, potentially highly pathogenic strains in their tropical wintering grounds

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



I. PROJECT STATEMENT

We propose to make the first assessment of the extent of malaria infection and possible routes of transmission in Minnesota birds.

- Avian malaria is a globally-distributed complex of diseases that have critical effects on individual and population health.
- Newly introduced strains of avian malaria have caused rapid declines in resident birds elsewhere (e.g, Hawaii and South America) and novel avian malaria strains could have a similar effect on Minnesota birds.
- We do not know how frequently migratory birds (such as blackbirds, warblers, robins, and sparrows) transmit malaria to resident bird species (such as grouse, pheasants, woodpeckers, chickadees, crows and jays), or if any of the strains that occur have tropical origins.

Our **GOALS** are to:

- 1) Determine the strains of malaria circulating in Minnesota, and whether they differ between migratory and resident birds.
- 2) Assess the potential of migratory birds to transmit avian malaria to birds (including game birds) resident in Minnesota.

Background:

Avian malaria is common in wild birds, with individual strains having a wide range of effects on survival and reproduction. Introduction of novel malaria strains can have substantial impacts on wild bird populations, especially in resident birds with no prior exposure, as has been seen in the endangered birds of Hawaii. New, highly pathogenic strains appear to be spreading globally with possible impacts for naïve populations such as those found in Minnesota. Our understanding of how malaria is transported during migration in the western hemisphere, and to what extent malaria strains are transmitted between migrant and resident wild bird populations, is poor. To begin to address this knowledge gap, we propose to study avian malaria occurrence and transmission in the wild birds of Minnesota. Currently, it is unknown what Minnesota species harbor malaria, which strains they carry, and whether they are infected locally or on their tropical wintering grounds. By understanding transmission from migrant to resident species pools, we can better understand how malaria is likely to spread or persist, and determine ways to control or lessen the impact of new malarial strains.

II. PROJECT ACTIVITIES AND OUTCOMES

Activity 1: Sampling migrant and resident birds for avian malaria. The objective of this activity is to gather samples of blood to assess the prevalence of avian malaria in migrant and resident birds. Because different species migrate to different ecosystems (i.e., deciduous forest, boreal forest, and grassland) in Minnesota, sampling will take place in each ecosystem along a transect, with a total sample of 1,500 migratory and 1,500 resident birds. We have selected six WMAs along the transect to sample: Kunkel, Gendoro, Sand Prairie, Daniel Shay, Vision and Sedan, although we will adjust sampling in response to constraints and opportunities that arise. Cost per sample is roughly \$16.

ENRTF BUDGET: \$52,400

Outcome	Completion Date
1. Capture and sample ≥ 3000 breeding resident and migrant birds (May-July)	August 2022

Activity 2: Genotyping and prevalence analysis. The objective of this activity is to genotype samples for malarial strains. Sequencing two genetic markers will identify malarial infections, at a cost of \$46 per bird, including



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materials (\$37 per bird) and labor (\$10 per bird). Sequencing will provide the data necessary to understand species- and ecosystem-level prevalence as well as detecting transmission among migrant and resident populations.

ENRTF BUDGET: \$ 178,300

Outcome	Completion Date
1. Perform PCR and sequencing for avian malaria strains	November 2022
2. Identification of malaria strains and estimation of infection rates	January 2023

Activity 3: Prevalence and transmission analysis. Analysis of these data will provide a species- and ecosystem-level picture of malaria prevalence, as well as revealing transmission between migratory and resident populations. We anticipate two peer-reviewed publications from this work, one for species- and ecosystem-level disease prevalence data, and one outlining transmission among species. In addition, these data will be shared with Minnesota Department of Natural Resources, and a report detailing recommendations for how to approach and manage new disease transmissions will be provided.

ENRTF BUDGET: \$85,300

Outcome	Completion Date
1. Determination of transmission rates between migrant and resident species	January 2023
2. Writing results, submission of papers to peer-reviewed journals, report detailing recommendations to MN DNR	June 2023

III. PROJECT PARTNERS:

A. Partners receiving ENRTF funding

N/A

B. Partners NOT receiving ENRTF funding

N/A

IV. LONG-TERM- IMPLEMENTATION AND FUNDING:

This project will provide a valuable baseline survey of malarial prevalence in Minnesota's wild birds. More importantly, this study will provide the first estimate of how frequently malaria strains are transmitted between migrant and resident populations. Results will be shared in the form of peer-reviewed publications, as well as direct reports targeted to appropriate institutions such as the University of Minnesota Veterinary School and the Minnesota Department of Natural Resources. Continuation of this research will be funded by future applications to the NIH, NSF, and other agencies.

V. TIME LINE REQUIREMENTS:

This project is time sensitive for the collection during the spring (approximately April 1- June 30). If funded, this project is planned for three years and will commence July 2020.

VI. SEE ADDITIONAL PROPOSAL COMPONENTS:

A. Proposal Budget Spreadsheet

B. Visual Component or Map

Attachment A: Project Budget Spreadsheet
 Environment and Natural Resources Trust Fund
 M.L. 2020 Budget Spreadsheet

Legal Citation:

Project Manager: F. Keith Barker

Project Title: Malaria in migrant and resident birds of Minnesota

Organization: University of Minnesota

Project Budget: 316,000

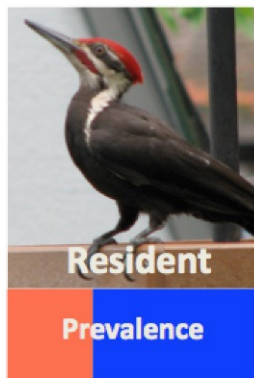
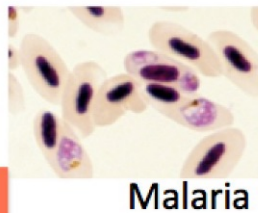
Project Length and Completion Date: 3 years, 06/30/2023

Today's Date: 04/11/2019

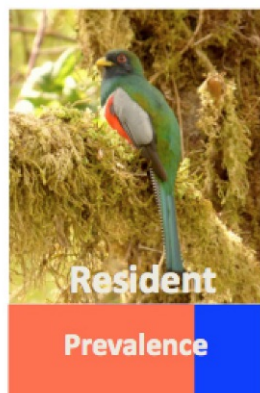
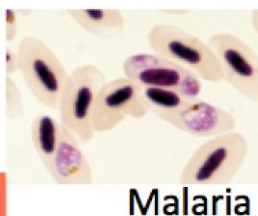


ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET		Budget	Amount Spent	Balance
BUDGET ITEM				
Personnel (Wages and Benefits)		\$ 198,000	\$ -	\$ 198,000
Michael Wells, postdoctoral researcher. 100% FTE for three years, (80% salary, 20% benefits), 198,000				
Equipment/Tools/Supplies				
Bird sampling supplies (mist nets an traps, needles, swabs, blood collection tubes, gloves)		\$ 3,000	\$ -	\$ 3,000
Genotyping malaria for 3,000 birds. \$37 per bird		\$ 111,000	\$ -	\$ 111,000
Travel expenses in Minnesota				
4 wheel drive vehicle mileage [1 (2020 and 2021) vehicle @ \$0.58/ mile x approximately 200 miles per day x 15 days]		\$ 4,000	\$ -	\$ 4,000
Other				
		\$ -	\$ -	\$ -
COLUMN TOTAL		\$ 316,000	\$ -	\$ 316,000
SOURCE AND USE OF OTHER FUNDS CONTRIBUTED TO THE PROJECT				
	Status (secured or pending)	Budget	Spent	Balance
Non-State:		\$ -	\$ -	\$ -
State:		\$ -	\$ -	\$ -
In kind: Indirect costs associated with this project @ 54% MTDC		\$ 170,000	\$ -	\$ 170,000
Other ENRTF APPROPRIATIONS AWARDED IN THE LAST SIX YEARS				
	Amount legally obligated but not yet spent	Budget	Spent	Balance
		\$ -	\$ -	\$ -

Malaria in Migrant and Resident Birds of Minnesota



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Project Manager Qualifications and Organization Description

F. Keith Barker

Address: Department of Ecology, Evolution and Behavior, 100 Ecology Building, 1987 Upper Buford Circle, St. Paul, Minnesota, 55108, Fax 612-624-6777, Tel 612-624-2737, E-mail barke042@umn.edu

Professional preparation:

Reed College, Portland, Oregon B.A. in Biology, 1993
University of Chicago, Ph.D. in Evolutionary Biology 1999

Professional appointments:

Bell Museum of Natural History, University of Minnesota, Minneapolis, Minnesota
Curator of Genetic Resources (2008-present)
Department of Ecology, Evolution and Behavior, University of Minnesota, St. Paul, Minnesota
Associate Professor (2008-present)
American Museum of Natural History, New York, NY
Research Associate in Ornithology (2003-present)

Qualifications:

The project manager currently manages the genetic resources collections (including an extensive blood sample collection), is interim curator of the bird collection and curator of genetic resources, and is in charge of database management for the scientific collections of the Bell Museum. His research focus is on genetic analysis of birds, using methods identical to most of those proposed for the current project. During his career he has published over 46 peer-reviewed scientific articles; in addition, he has received and managed multiple grants with budgets up to \$340,000.

Organization description:

The Bell Museum of Natural History was established by state legislative mandate in 1872 to collect, preserve, skillfully prepare, display, and interpret our state's diverse animal and plant life for scholarly research and teaching and for public appreciation, enrichment, and enjoyment. Its governance belongs, by state legislative designation, to the University of Minnesota.

The exceptional scientific collections of the Bell Museum continue to grow as state agencies deposit biological specimens annually. Nearly 4 million specimens of mammals, birds, fishes, plants, mollusks, insects and fungi provide opportunities for research and learning. The Museum houses the world's largest collection of Minnesota biodiversity. Academic curators are internationally known researchers with expert knowledge spanning the tree of life. The unique synergy of research, teaching, and public engagement, possible only on the campus of a great university, distinguishes the Bell Museum as a cradle of innovation in environmental science.