Environment and Natural Resources Trust Fund
2018 Request for Proposals (RFP)

Project Title: **ENRTF ID: 018-A**

Mapping Avian Movement in Minnesota

Category: A. Foundational Natural Resource Data and Information

Total Project Budget: $ 682,060

Proposed Project Time Period for the Funding Requested: 3 years, July 2018 to June 2021

Summary:

Establish network of automated radiotelemetry stations to monitor bird migration and local movements of a threatened species, and develop strategic plans for long-term use of infrastructure to monitor animal movement.

Name: Gerald Niemi

Sponsoring Organization: U of MN - Duluth NRRI

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Web Address

Location

Region: Statewide

County Name: Statewide

City / Township:

Alternate Text for Visual:

Our project will build and deploy Motus receiver towers throughout the state to assess migratory timing, routes, and stopover habitat for Minnesota's migrating birds.

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

PROJECT TITLE: Mapping Avian Movement in Minnesota

I. PROJECT STATEMENT

Our project will establish a network of automated radiotelemetry stations to monitor bird migration through Minnesota, document local movements of a "Species of Greatest Conservation Need" (SGCN), and develop strategic plans for long-term use of infrastructure to monitor animal movement within the state.

- Tens of millions of birds, including waterfowl, cranes, loons, eagles, and hundreds of songbirds, migrate through the state annually, but we know little about their migratory pathways.
- Documenting local movements and habitat use of breeding birds will provide critical information to managers interested in prioritizing conservation efforts.
- New technology to track details of migratory flights and local movements has recently been developed.
- Documenting major migratory routes and tracking local movements can greatly facilitate and improve conservation planning to protect Minnesota's birds.

Avian movement has long fascinated scientists and bird-lovers; however techniques for studying movement have been limited. Recently a consortium of researchers developed a system of receiving stations that collect locations of migratory and resident birds carrying relatively inexpensive transmitters. This growing system, referred to as the **Motus network**, currently has its greatest density in the Eastern Great Lakes region of the United States and Canada. We propose to join this network by adding receiving stations in Minnesota to study animal movement, dispersal, and migration. Our project consists of two applications of Motus technology: **1)** to identify large-scale migratory corridors and stopover habitat across the state, and **2)** to identify local movements and dispersal behavior of juvenile Common Terns. The specific goals of this project are to:

1) Develop a network of Motus stations throughout the state;
2) Identify and quantify spring (northward) and fall (southward) migration routes and stopover habitat
3) Implement Motus receivers to track local movements, foraging locations, and dispersal of Common Terns in the St. Louis River Estuary to inform conservation strategies
4) Develop best management practices for Motus-based research to facilitate collaborative research on animal movement throughout the state

II. PROJECT ACTIVITIES AND OUTCOMES

Activity 1: Assess migratory timing, routes, and stopover locations for Minnesota's migrating birds **Budget: $308,453**

We will establish a grid of 40 Motus receivers throughout Minnesota to identify and quantify fall and spring migration pathways throughout the state. Receivers will be deployed in strategic locations throughout the state targeting migratory flyways and operated during spring and fall migration. We will partner with banding stations to attach transmitters to various migratory songbird and raptor species during spring and fall migration.

Outcome	Completion Date
1. Identify government, academic, NGO, and private partners to host Motus stations across Minnesota.	December 2018
2. Partner with banding stations and existing wildlife projects throughout the state to place a minimum of 400 transmitters on passerines, waterbirds, and raptors.	October 2020
3. Identify and evaluate Minnesota's spring (northward) and fall (southward) migration corridors and associated stopover locations.	February 2021

Activity 2: Assess local movements and dispersal behavior of Common Terns in the St. **Budget: $239,753**

Louis River Estuary.
In collaboration with MN DNR, we will place transmitters on juvenile Common Terns hatched on Interstate Island in the Duluth harbor. We chose to focus on Common Terns because they are a threatened species in Minnesota and identified by the MNDNR as a SGCN. Interstate Island, in the St. Louis River Estuary, is one of only two breeding colonies for Common Terns in Lake Superior and one of four colonies in the state. Determining the local movements, habitat use, and dispersal of juvenile terns will greatly aid in the development of Common Tern management plans, as tracking this age-class has not previously been feasible using other tracking methodologies. The Motus receivers used in Activity 1 will be redeployed during the breeding and post-breeding season (July-September) along the St. Louis River Estuary and south shore of Lake Superior to track local movements, habitat use, and dispersal of juvenile birds.

Outcome	Completion Date
1. Band and tag a minimum of 100 juvenile Common Terns for two breeding seasons.	September 2020
2. Establish a network of Motus receivers along the St. Louis Estuary and south shore of Lake Superior to determine local movements and dispersal of juvenile Common Terns.	September 2020
3. Incorporate movement and habitat use information into Common Tern recovery plans.	June 2021

Activity 3: Develop strategic plans for long-term infrastructure of the Motus network to monitor migration and local movements of Minnesota's wildlife. **Budget: $133,854**

Data collected from Activity 1 and Activity 2 will be complied to assess the utility of Motus receivers for large-scale (migration) and small-scale (local movements) research in Minnesota. We will develop best management practices for building, deploying, managing, and analyzing data from the Motus network to share with researchers and state agencies to facilitate large-scale and long-term research on animal movement.

Outcome	Completion Date
1. Determine differences in data quantity and quality between large-scale and small-scale Motus applications.	February 2021
2. Develop and disseminate best management practices and publish project summaries to facilitate animal movement research within the state.	June 2021

III. PROJECT STRATEGY

A. Project Team/Partners

The project team includes Dr. Gerald Niemi, Dr. Alexis Grinde and Annie Bracey from the Natural Resources Research Institute, and Dr. Matthew Etterson of Hawk Ridge Bird Observatory. We will work with government, academic, NGO, and private partners to deploy and manage receivers across the state.

B. Project Impact and Long-Term Strategy

This proposal is a part of a larger effort to understand avian migration in Minnesota. The major advantage of the Motus system is that the receivers are small, portable, and can be easily redeployed. This will allow us the flexibility to monitor local and migratory movements at various locations throughout the state and to move receivers based on the research question being posed. This project will create the infrastructure and provide foundational information that can be used by researchers throughout the state and will greatly improve our understanding of migration for multiple taxa including bats, dragonfly, and butterfly movements in MN. Additionally, the equipment used in this study will be built and maintained by NRRI and can be utilized for future research projects.

C. Timeline Requirements

Two full field seasons are required with an additional year of data analysis and reporting; a total of three years.

2018 Detailed Project Budget

Project Title: Mapping Avian Movement in Minnesota

IV. TOTAL ENRTF REQUEST BUDGET: 3 years

BUDGET ITEM	AMOUNT
Personnel:	
Gerald Niemi, Principal Investigator (66.5% salary, 33.5% benefits); 1% effort each year for 3 years	$ 6,751
Alexis Grinde, Co-Investigator (66.5% salary, 33.5% benefits); 10% effort each year for 3 years	$ 32,645
Annie Bracey, Co-Investigator (66.5% salary, 33.5% benefits); 30% effort each year for 3 years	$ 74,855
Research Scientists (2), Fieldwork, Data Collection and Analysis (66.5% salary, 33.5% benefits); 75% cumulative effort each year for 3 years	$ 155,871
Undergraduate Research Assistant (100% salary); 50% effort each year in Y1 and Y2	$ 20,800
Migration Banding Coordinator (coordinate banding activities and transmitter deployment, data collection and anlysis, and database management) (72.8% salary, 27.2% benefits); 75% effort each year for 3 years	$ 131,438
Equipment/Tools/Supplies:	
20 sensor gnome telemetry receivers @ $1500 ea. These receivers will be deployed by project partners and will be used on buildings that have access to power supply.	$ 30,000
20 antennae ($210 ea.) to be used with sensor gnome telemetry receivers on buildings.	$ 4,200
20 antennae towers ($4800 ea.; Includes sensor gnome telemetry receivers, solar panels, shipping, and three 9-element antennas per tower). These receivers and associated equipment will be used in remote locations that do not have access to consistent power sources and without constant maintenance.	$ 96,000
500 transmitters ($200 ea.) to attach to birds (400 migrating birrds and 100 Common Terns) to track movements	$ 100,000
Motus registration fees. $1500 / year to register Motus stations on Motus network + $25 for each transmitter deployed (over 20 transmitters / year n=460) to track birds on Motus receivers outside of Minnesota.	$ 14,500
Travel:	
Travel for fieldwork, including mileage (75%) and lodging (25%) for researchers and banders. Mileage will be reimbursed at $0.535/mile (University of MN rate). Travel is largely associated with large-scale (state-wide) deployment and maintenance of the Motus receivers during the spring and fall migration. Lodging is estimated between ($90-$130 per night)	$ 15,000
TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND $ REQUEST =	$ 682,060

V. OTHER FUNDS

SOURCE OF FUNDS	AMOUNT	Status
Other Non-State $ To Be Applied To Project During Project Period:	N/A	
Other State $ To Be Applied To Project During Project Period:	N/A	
In-kind Services To Be Applied To Project During Project Period:		
Unrecovered indirect: 54% on total direct costs	$ 368,312	Secured
Past and Current ENRTF Appropriation:	N/A	
Other Funding History:	N/A	

Assess migratory timing, routes, and stopover locations for Minnesota's migrating birds

Proposed Minnesota Motus network

Identify stopover habitat used by migrating birds

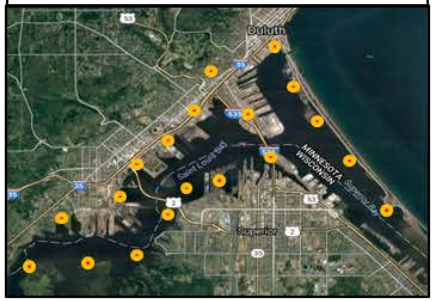
Track migrating and resident bird species

Motus antennae tower

Current Motus network

Assess local movements and dispersal behavior of Common Terns in the St. Louis River Estuary

Proposed Motus in St. Louis River Estuary network



Interstate Island Common Tern colony

Track local movements of Common Terns, a SGCN

2016 LCCMR Project Manager Qualifications and Organization Description

Dr. Gerald Niemi, Natural Resources Research Institute and Department of Biology, University of Minnesota Duluth

Key Qualifications

Dr. Niemi is an Ecologist at the Natural Resources Research Institute and Professor in the Department of Biology at the University of Minnesota Duluth. He has over 40 years of experience studying wildlife in Minnesota.

EDUCATION

Ph.D. Biology, Florida State University. **Thesis:** Ecological morphology of birds in New World and Old World Peatlands. **Adviser:** Dr. Frances James.
M.S. Biology. University of Minnesota, Duluth. **Thesis:** Habitat alteration: its effect on avian composition and habitat selection. **Adviser:** Dr. Pershing Hofslund.
B.S. Biology. University of Minnesota, Duluth. **Adviser:** Dr. John Carlson.

RELEVANT RESEARCH EXPERIENCE

Professor and Center Director. Department of Biology and Natural Resources Research Institute, University of Minnesota, Duluth. Taught courses in ornithology, conservation biology, and graduate courses on ecological processes and many special topics. Trained over 35 Ph.D. and M.S. graduate students in wildlife ecology. Served as Department Head and Center Director for twenty years where I managed and administered a staff of over 50 scientists, technicians, office staff, and students. I have over 250 peer-reviewed papers and technical reports.

PUBLICATIONS

Grinde, A., G.J. Niemi, C. Adams, and T.B. Wigley. 2017. The important role of young forests in forest biodiversity management. *The Forest Source 22:11-12.*

Zlonis, E., H. Panci, J.Bednar, M. Hamady, and G.Niemi. 2017. Habitats and landscapes associated with bird species in a lowland conifer-dominated ecosystem. *Avian Conservation and Ecology 12(1): 7.* https://doi.org/10.5751/ACE-00954-120107

Bracey, A.M., G.J. Niemi, M.A. Etterson, and R.F. Green. *2016.* Window related avian mortality at a migration corridor. *The Wilson Journal of Ornithology 128:355-367.*

Grinde, A.R., G.J. Niemi. 2016. A synthesis of species interactions, metacommunities, and the conservation of avian diversity in hemiboreal and boreal forests*. Journal of Avian Biol.47:1-13.*

Niemi, G.J., R. W. Howe, B.R. Sturtevant, L.R. Parker, A. Grinde, N.P. Danz, M. Nelson, E.J. Zlonis, N. Walton, and E. Gnass. 2015. Analysis of long term forest bird monitoring in national forests of the western Great Lakes Region. General Technical Report NRS-159. Newton Square, PA; U.S. Department of Agriculture, Forest Service, Northern Research Station, 322 p.

Peterson, A., G. Niemi, D. Johnson. 2015. Patterns in diurnal airspace use by migratory landbirds along an ecological barrier*. Ecological Applications* 25:673-684.

The **Natural Resources Research Institute** is a part of the University of Minnesota Duluth. NRRI's mission is to promote private sector employment based on natural resources in an environmentally sensitive manner.