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

Project Title: **ENRTF ID: 062-AH**

Engagement and Monitoring for the Insect Apocalypse

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

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

Total Project Budget: $ 191,824

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

Summary:

This project will document baseline insect biodiversity across Minnesota by deploying passive interception traps, and engaging with budding insect biologists to sort and identify collected material.

Name: Jessica Petersen

Sponsoring Organization: MN DNR

Job Title:

Department: Ecological and Water Resources

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Web Address:

Location:

Region: Statewide

County Name: Statewide

City / Township:

Alternate Text for Visual:

Image of a Malaise trap in a forest edge. Image of insects collected from a trap. Map of potential site locations in Minnesota.

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

PROJECT TITLE: Engagement and Monitoring for the Insect Apocalypse

I. PROJECT STATEMENT

This project will document baseline insect biodiversity across the state by deploying passive interception traps, and engaging with budding insect biologists to sort and identify collected material.

Need. Information on the distribution and diversity of most groups of insects is limited, to the point where we are likely losing species before we can document their existence and understand their role in the environment. Although we can speculate about the causes of these declines (climate change, habitat loss, pesticides), the first critical need towards understanding a mechanism for the losses is to broadly document insect diversity.

Background. Recent media attention has highlighted scientific reports, suggesting an *insect apocalypse* or *Armageddon* is upon us. Evidence suggests that the sheer numbers of insects are potentially suffering dramatic declines. Insects are major regulators of ecosystem services including pollination of native plants and agricultural crops, soil decomposition, and biological control of pests. Loss of insects is predicted to cause cascading declines in food webs that depend heavily on them as food resources.

The few studies with enough long-term insect data to describe trends through time suggest population declines of 40-75% over the last several decades. The insect species for which we have enough data to detect declines represents a small fraction, likely 1%, of the total diversity. However, our knowledge about the 1% may be insufficient to provide a solid base for management and conservation of the other 99%. The relative lack of long-term datasets is a call to action to improve our understanding of insect abundance and diversity in Minnesota.

Goal. We propose to contribute to the global efforts to document insect diversity by establishing a baseline insect biodiversity survey across Minnesota. This sampling will provide opportunities to begin species-level surveys of poorly-known insect groups. This project will engage with citizen-scientists to collect data and with students of insect biology to further the capacity to study insects in Minnesota.

Surveys will employ a network of Malaise traps, standard tent-like nets used to efficiently trap various insect groups, at stratified locations across sites with existing long-term monitoring through the ENRTF project, *Statewide Monitoring Network for Changing Habitats in Minnesota*. Sites will be selected to represent the diversity of Minnesota's ecosystems. Malaise traps are being globally employed as a means of surveying insect diversity and have been shown to capture upwards of 5,000 insect species. Citizen-scientists have been essential to successful monitoring efforts addressing the issue of insect declines. We propose to engage with citizen-scientists to assist in sample collection. Likewise, we will collaborate with entomologists statewide to pursue student and faculty participation in documenting species-level diversity.

Outcome. This project seeks to establish a baseline survey of insect diversity, upon which future monitoring will be founded. We will engage with students and citizens to bring awareness to insect biodiversity.

II. PROJECT ACTIVITIES AND OUTCOMES

Activity 1 Title: Establish baseline insect biodiversity assessment in Minnesota

Description: *This work seeks to establish baseline insect surveys to better understand the faunistic diversity and distribution. We will establish a network of Malaise traps at 20 sites across Minnesota. These traps are the standard methodology for broadening our understanding of insect diversity and have been used extensively in published reports documenting insect declines. We will engage with Minnesota citizen-scientists,*

local to the sites where traps are deployed to collect trap contents. Likewise, we will connect with local colleges and universities to engage young scientists in the pursuit of furthering our understanding of insect diversity in Minnesota and building interest in the field of insect conservation.

ENRTF BUDGET: $ 191,824

Outcome	Completion Date
1. Establish and deploy a network of 20 Malaise traps at 20 sites across Minnesota	*November, 2021*
2. Engage with Minnesotans to collect, sort, and identify insects	*June, 2023*

III. PROJECT PARTNERS AND COLLABORATORS:

We will engage with the University of Minnesota Insect Collection staff to coordinate preservation and curation of insect specimens. Likewise, collaborators that teach entomology at the University of Minnesota, St. Olaf College, and Concordia College will engage with students to sort trap contents. Through this collaboration, students will have the opportunity to learn about and document insect diversity in Minnesota.

IV. LONG-TERM IMPLEMENTATION AND FUNDING:

This project establishes a baseline upon which future surveys of insect biodiversity will be based. This is the first phase of establishing a long-term monitoring project. By using previously established long-term monitoring sites through the *Statewide Monitoring Network for Changing Habitats* project, we will be able to make inferences about trends across plants and insects through time. This is the initial phase of what will be a long-term monitoring effort with repeated surveys at regular intervals through time. Traps can be re-used, but we will seek additional funding sources to support specimen sorting during future rounds of surveys.

V. SEE ADDITIONAL PROPOSAL COMPONENTS:

A. Proposal Budget Spreadsheet
B. Visual Component or Map
F. Project Manager Qualifications and Organization Description

Attachment A: Project Budget Spreadsheet
Environment and Natural Resources Trust Fund
M.L. 2020 Budget Spreadsheet
Legal Citation:
Project Manager: Jessica Petersen
Project Title: Engagement and Monitoring for the Insect Apocalypse
Organization: Minnesota Department of Natural Resources
Project Budget: $191,824
Project Length and Completion Date: 3 years, June 2023
Today's Date: April 12, 2019

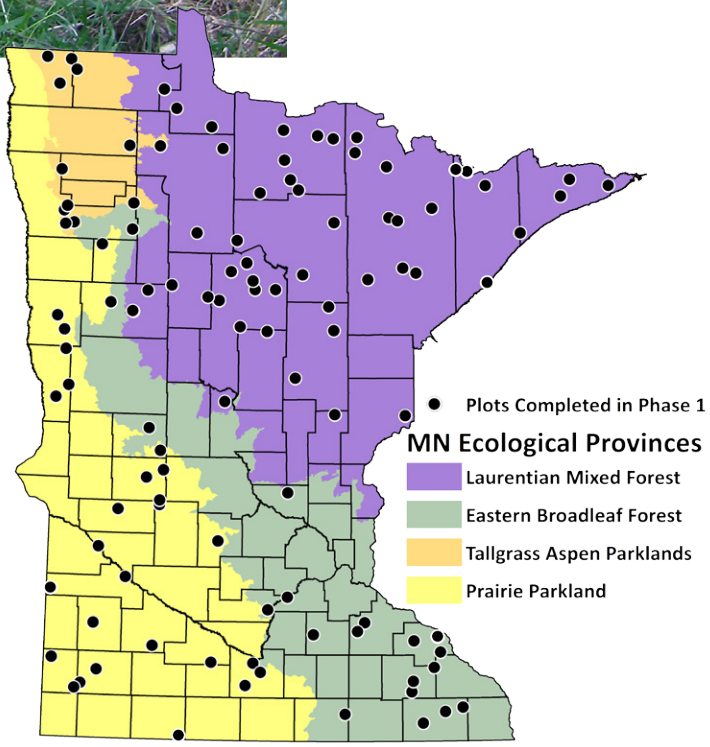
ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET	Budget	Amount Spent	Balance
BUDGET ITEM			
Personnel (Wages and Benefits)	$ 162,000	$ -	$ 162,000
Invertebrate Ecologist, Project Lead, $65,000 (72% salary 28% benefits), 0.3 FTE Unclassified each year for 2 of 3 years.			
Citizen Science Coordinator, $36,000 (72% salary 28% benefits), 0.3 FTE Unclassified each year for 2 of 3 years.			
Insect Technician, $61,000 (72% salary 28% benefits), 0.5 FTE Unclassified each year for 2 of 3 years.			
Equipment/Tools/Supplies			
Malaise traps, ethanol, collection and preservation supplies	$ 7,000	$ -	$ 7,000
Travel expenses in Minnesota			
Travel in-state to install and sample monitoring plots; 20 field days, 5,000 miles. Vehicles ($3,400), lodging ($2,000), and meals ($800) in accordance with the Commissioner's Plan.	$ 6,200.00	$ -	$ 6,200
Other			
Direct and necessary costs to cover HR support ($3,372), Safety Support ($610), Financial Support ($2,096), Communication Support ($1,388), IT Support ($8,020), and Planning Support ($1,138).	$ 16,624	$ -	$ 16,624
COLUMN TOTAL	$ 191,824	$ -	$ 191,824

SOURCE AND USE OF OTHER FUNDS CONTRIBUTED TO THE PROJECT	Status (secured or pending)	Budget	Spent	Balance
State:				
General Fund - project supervision and technical guidance	Pending	$ 10,000	$ -	$ 10,000
Other ENRTF APPROPRIATIONS AWARDED IN THE LAST SIX YEARS	**Amount legally obligated but not yet spent**	**Budget**	**Spent**	**Balance**
N/A		$ -	$ -	$ -

Insect Apocalypse in the Age of Humans

Reported world-wide declines in insect numbers are a call to action for gathering missing baseline data on Minnesota's invertebrates.

A Malaise trap, a method for accessing biological diversity that is used globally. In a single setting, upwards of 5,000 species may be surveyed using this method.



Project Manager Qualifications and Organization Description

Project Manager: Dr. Jessica Petersen, Invertebrate Ecologist
Minnesota Department of Natural Resources – Minnesota Biological Survey

Qualifications:

Jessica Petersen has been employed by the DNR for almost 3 years, and with the Minnesota Biological Survey for the past nine months. During this time she has managed teams of scientists, delivered scientific content to practitioners by hosting webinars, podcasts, and written content. She has training and experience conducting scientific research in such topics as bee and butterfly community ecology, plant-insect interaction, pollination, and prairie ecology that have resulted in 14 co-authored scientific publications, 12 invited presentations, and 14 extension and outreach publications. Dr. Petersen has taught 6 undergraduate biology courses including topics such as Geographic Information Systems (GIS), entomology, and critical thinking.

Experience:

- B.S. – University of Iowa, 2002
- M.S., Ecology and Evolutionary Biology – Iowa State University, Iowa 2003-2005
- Ph.D, Entomology, Minor – Statistics – Iowa State University, Iowa 2005-2010
- Post-doctoral Research – Cornell University, New York 2010-2014
- Adjunct Professor – Roanoke College, Virginia 2014-2016

Project Manager Responsibilities:

Jessica Petersen will lead the project coordination including selecting site locations, communicating with collaborative entomology faculty, and data collection on insect diversity. The project manager will be responsible for developing and implementing a work plan including achievable outcomes and tracking and reporting on project progress.

Organization Description: Minnesota DNR

The proposed project directly supports the following goals outlined by the MNDNR:

- 10-year Strategic Conservation Agenda, Goal 1, Minnesota's waters, natural lands, and diverse fish and wildlife habitats are conserved and enhanced.
- Goal 1 of Minnesota's Wildlife Action Plan: Ensure the long-term health and viability of Minnesota's wildlife, with a focus on species that are rare, declining, or vulnerable to decline.

The Minnesota Department of Natural Resources (DNR)'s mission is to work with citizens to conserve and manage the state's natural resources, to provide outdoor recreation opportunities, and to provide for commercial uses of natural resources in a way that creates a sustainable quality of life.