

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

Project Title:**ENRTF ID: 011-A**

Completion of Wild Bee Surveys: Minnesotas Forest Habitats

Category: A. Foundational Natural Resource Data and Information**Sub-Category:****Total Project Budget: \$** 664,593**Proposed Project Time Period for the Funding Requested:** June 30, 2023 (3 yrs)**Summary:**

Complete the statewide bee survey by surveying at up to 75 sites in the Laurentian Mixed Forest Province, thus building the foundation for detecting changes in bee fauna through time.

Name: Jessica Petersen**Sponsoring Organization:** MN DNR**Job Title:****Department:** Ecological and Water Resources**Address:** 500 Lafayette Road

St. Paul MN 55155

Telephone Number: (651) 259-5130**Email** jessica.d.petersen@state.mn.us**Web Address****Location:****Region:** Northeast**County Name:** Aitkin, Becker, Beltrami, Benton, Carlton, Cass, Chisago, Clearwater, Cook, Crow Wing, Hubbard, Isanti, Itasca, Kanabec, Kandiyohi, Koochiching, Lake, Lake of the Woods, Mahnommen, Mille Lacs, Morrison, Otter Tail, Pine, Roseau, St. Louis, Todd, Wadena**City / Township:****Alternate Text for Visual:**

Map of the remaining portion of the state needing surveys. Photo of handnetting bees. Outcomes indicating conservation of rare bees and monitoring bee change through time.

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



PROJECT TITLE: Completion of Wild Bee Surveys: Minnesota's Forest Habitats

I. PROJECT STATEMENT

Complete the statewide bee survey by surveying at up to 75 sites in the Laurentian Mixed Forest Province, thus building the foundation for detecting changes in bee fauna through time.

Need. The wild bee diversity in Minnesota was largely undescribed prior to ENRTF investments in wild bee surveys in the Prairie Parkland Province, Tallgrass Aspen Parklands Province, and Eastern Broadleaf Forest Province. This project proposes bee surveys in the remaining portion of the state, the Laurentian Mixed Forest (LMF) Province, thereby completing the statewide baseline bee survey. The LMF covers 43% of the state, but counties are under-sampled and proportionally few wild bee studies have been conducted there. Only 12% of bee specimens housed in insect collections reviewed by the MNDNR were collected from counties in the LMF. Similarly, only 14% of Minnesota Wild Bee Atlas records fall within the LMF. Likewise, little is known about the plant associations of bee species in the LMF. We propose surveying the bee community in a variety of habitats (e.g., conifer and mixed conifer-hardwood forests, lowland conifer swamps and peatlands) in each county.

Wild bees, such as bumble bees and leafcutter bees, are vital components of Minnesota's forest ecosystems. Bees, along with other animals, pollinate an estimated 78% of plants in the temperate ecosystems – thereby supporting native plant communities that store carbon, prevent soil erosion and provide food and shelter for wildlife. Data from baseline bee surveys are used to make important conservation decisions. For example, previous surveys in the prairies and broadleaf forests have filled information gaps by providing data on species distributions for federal listing proposals for Rusty-patched bumble bee and Yellow-banded bumble bee.

Goals of the project:

1. Expand and enhance our knowledge of Minnesota's wild bees and their plant associations by documenting bees from LMF habitats,
2. Manage data in an existing centralized database,
3. Deliver project results and information for all Minnesotans, and
4. Deliver outreach programs focused on Minnesota wild bee identification and monitoring.

This project will form the foundation upon which future research and monitoring of trends in bee diversity and distribution will be based.

II. PROJECT ACTIVITIES AND OUTCOMES [Total request \$ 664,593]

Activity 1 Title: Wild bee surveys in the Laurentian Mixed Forest

Description: Bee surveys will be conducted within the Laurentian Mixed Forest ecological province throughout the active foraging period and across habitat types to maximize the documented species diversity. Various methods will be used to capture the diversity of bees. Photography will be used where possible to minimize destructive sampling. All voucher specimens collected will be pinned, identified, and entered into a database with associated habitat information. A taxonomist will confirm specimen identification. Specimens will be accessioned into the University of Minnesota Insect Collection.

ENRTF BUDGET: \$ 564,904

| Outcome | Completion Date |
|---|-----------------|
| 1. Field surveys of wild bees and associated plant species at up to 75 sites in the LMF | June 2023 |



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| 2. Specimen preparation, identification, data entry, and deposition into the Insect Collection | June 2023 |
|--|-----------|

Activity 2 Title: Wild bee education and outreach

Description: Continue to develop summary documents on wild bees, including updates to the state list of bee species and dedicated MNDNR webpages. Wild bee identification and monitoring workshops will be conducted to increase technical expertise using the Upper Midwest Citizen Science Monitoring Guide developed by Xerces Society and funded through ENRTF. Other outreach activities include presentations to schools, non-profit organizations, scientific audiences, and conservation groups.

ENRTF BUDGET: \$ 99,689

| Outcome | Completion Date |
|---|-----------------|
| 1. Compile data and develop summary products on wild bees | June 2023 |
| 2. Coordinate 3 expert-led bee identification workshops | March 2023 |
| 3. Conduct public outreach activities | June 2023 |

III. PROJECT PARTNERS AND COLLABORATORS:

| Name | Title | Affiliation | Role |
|---|--|--|--|
| Dr. Ralph Holzenthal Dr. Robin Thomson | Director of the Collection Curator of Insects | University of Minnesota Insect Collection | Permanent repository and curation of specimens |
| Dr. Dan Cariveau | Assistant Professor | University of Minnesota Bee Lab | Collaborator in developing state list |
| Sarah Foltz Jordan | Senior Pollinator Conservation Specialist | Xerces Society for Invertebrate Conservation | Collaboration on workshops |

IV. LONG-TERM IMPLEMENTATION AND FUNDING:

This timeframe will produce results that can stand alone or act as the beginning phase of a long-term monitoring program. Alone, this project's duration is insufficient to account for yearly fluctuations of insect populations, but can serve as a foundation on which to build such a data set. Expansion of surveys into the Laurentian Mixed Forest will add to our knowledge of wild bee fauna in a new ecological setting.

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: Completion of Wild Bee Surveys: Minnesota's Forest Habitats

Organization: MN DNR

Project Budget: \$664,593

Project Length and Completion Date: 3 years, June 30th, 2023

Today's Date: 4/10/2019



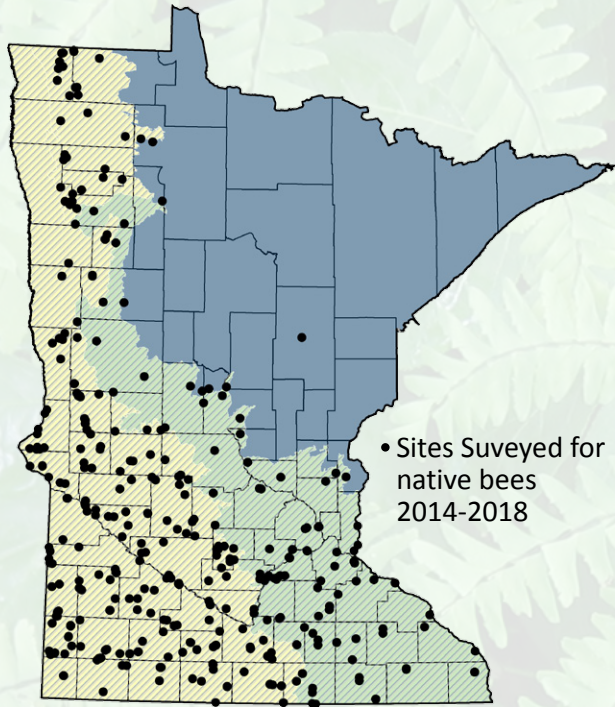
| ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET | | Budget | Amount Spent | Balance |
|---|--|------------|--------------|------------|
| BUDGET ITEM | | | | |
| Personnel (Wages and Benefits) | | \$ 503,000 | \$ - | \$ 503,000 |
| Entomologist Research Scientist/Project Lead (unclassified), \$82,000 (65%salary 35%benefits), 0.25 FTE each year for 3 of 3 years | | | | |
| Entomologist Natural Resource Specialist/Field Lead (unclassified), \$176,000 (70% salary 30% benefits), 1.0 FTE each year for 3 of 3 years (70% salary/30% benefits) | | | | |
| Bee Survey Assistants (unclassified), \$216,000 (72% salary 28% benefits), 1.2 FTE each year for 3 of 3 | | | | |
| Zoology Data Manager (unclassified), \$13,000 (73% salary 27% benefits), 0.05 FTE each year for 3 of | | | | |
| Information Outreach Specialist (unclassified) \$16,000 (64% salary/36% benefits) 0.05 FTE each year for 3 of 3 years | | | | |
| Professional/Technical/Service Contracts | | | | |
| TBD (competitive bid): Biologists for expert bee identification workshops | | \$ 10,000 | \$ - | \$ 10,000 |
| TBD (competitive bid): Biologists for expert bee identification confirmations | | \$ 10,000 | \$ - | \$ 10,000 |
| Equipment/Tools/Supplies | | | | |
| Field equipment and supplies to conduct bee surveys (GPS units, maps, data recorders, cameras, traps, nets, collecting containers, first-aid equipment) | | \$ 6,000 | \$ - | \$ 6,000 |
| Specimen preparation and storage supplies (pins, pinning boards, specimen drier, drawers, boxes, unit trays) | | \$ 8,000 | \$ - | \$ 8,000 |
| Outreach supplies to conduct workshops and presentations (specimen display boxes, collecting containers, pinning supplies) | | \$ 1,000 | \$ - | \$ 1,000 |
| Travel expenses in Minnesota | | | | |
| Travel to conduct bee surveys, ~260 field days, ~40,000 miles. Vehicles, lodging, and meals in accordance with the Commissioner's Plan. | | \$ 75,000 | \$ - | \$ 75,000 |
| Other | | | | |
| Direct and necessary costs to cover HR support (~\$11,724), Safety Support (~\$2,122), Financial Support (~\$7,334), Communication Support (~\$1,388), IT Support (~\$27,887), and Planning Support (~\$1,138). | | \$ 51,593 | \$ - | \$ 51,593 |
| COLUMN TOTAL | | \$ 664,593 | \$ - | \$ 664,593 |
| | | | | |
| SOURCE AND USE OF OTHER FUNDS CONTRIBUTED TO THE PROJECT | Status (secured or pending) | Budget | Spent | Balance |
| Non-State: | N/A | \$ - | \$ - | \$ - |
| State: | | | | |
| General Fund for program zoologist project supervision, oversight, guidance. | Pending | \$ 40,000 | \$ - | \$ 40,000 |
| In kind: | N/A | \$ - | \$ - | \$ - |
| Other ENRTF APPROPRIATIONS AWARDED IN THE LAST SIX YEARS | Amount legally obligated but not yet spent | Budget | Spent | Balance |
| M.L. 2014 Chap. 226 Sec. 2 Subd. 05i Wild Bee Pollinator Surveys in Prairie-Grassland Habitats | | \$ 370,000 | \$ 370,000 | \$ - |
| M.L. 2016 Chap. 186 Sec. 2 Subd. 03b Native Bee Surveys in Minnesota Prairie and Forest Habitats | | \$ 600,000 | \$ 540,000 | \$ 60,000 |



The Minnesota Biological Survey has documented 7 individuals of Yellow-banded bumble bee (*Bombus terricola*). Surveys in the Laurentian Mixed- Forest could add more records of this vulnerable species to better understand its conservation status.

Need: The wild bee diversity is largely unknown from 43% of Minnesota

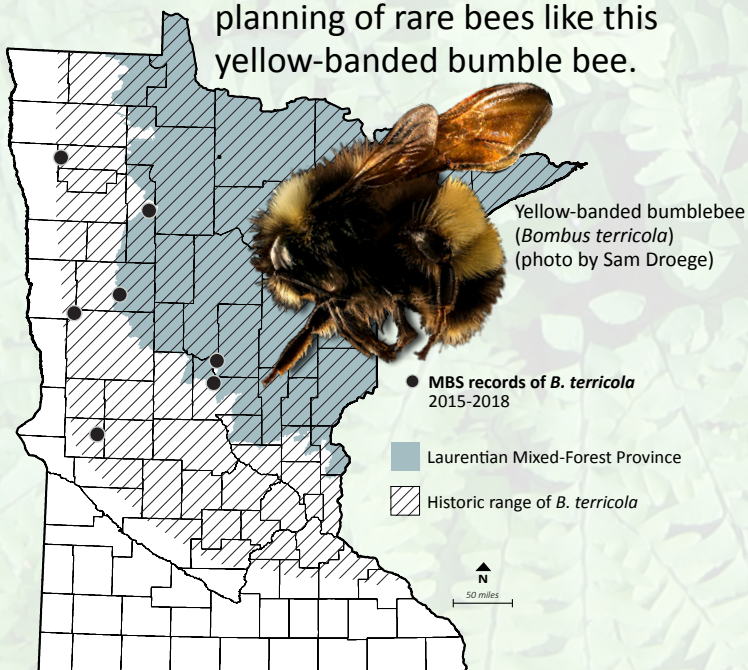
Solution: Survey 75 forested habitats in the Laurentian Mixed Forest province.



Outcomes

More informed conservation planning of rare bees like this yellow-banded bumble bee.

Baseline data to monitor changes in bee diversity through time.



Bee Trends Through Time



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 survey design and assist the field lead in coordinating surveys. She will be responsible for developing and implementing a work plan including achievable outcomes and tracking and reporting on project progress. Jessica will coordinate data collection and analysis, outreach events and collaboration among colleagues, and workplan reporting responsibilities.

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.