

**Environment and Natural Resources Trust Fund
2016 Request for Proposals (RFP)**

Project Title:

ENRTF ID: 005-A

Wild Bee Surveys in Minnesotas Prairie-Forest Habitats

Category: A. Foundational Natural Resource Data and Information

Total Project Budget: \$ 707,364

Proposed Project Time Period for the Funding Requested: 3 years, July 2016 to June 2019

Summary:

The DNRs Minnesota Biological Survey will expand its wild bee surveys into the prairie-forest border region. Public outreach activities include bee identification workshops and the state species list of bees.

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Sponsoring Organization: MN DNR

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Web Address http://www.dnr.state.mn.us/mbs/grasslandbees.html

Location

Region: Central, Metro, NW, SW, SE

County Name: Anoka, Becker, Benton, Big Stone, Blue Earth, Brown, Carver, Chippewa, Chisago, Clearwater, Cottonwood, Dodge, Douglas, Faribault, Fillmore, Goodhue, Grant, Hennepin, Houston, Isanti, Jackson, Kittson, Lac qui Parle, Le Sueur, Lincoln, Lyon, Mahnomen, Martin, McLeod, Meeker, Mille Lacs, Mower, Murray, Nicollet, Nobles, Olmsted, Otter Tail, Pennington, Polk, Pope, Ramsey, Red Lake, Renville, Rice, Rock, Roseau, Sherburne, Sibley, Stearns, Stevens, Swift, Todd, Traverse,

City / Township:

Alternate Text for Visual:

This map shows the number of bee species recorded per county, based on museum specimens as of January 1, 2015. Counties with the most records are concentrated near the metro region. Counties in the Central and Southwest region are particularly undersampled.

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



PROJECT TITLE: Wild Bee Surveys in Minnesota's Prairie - Forest Habitats

I. PROJECT STATEMENT

Wild bees, such as bumble bees and leafcutter bees, are vital components of prairie and forest ecosystems. The DNR's Minnesota Biological Survey (MBS) proposes to expand its wild bee surveys into the prairie-forest border region. Accumulated data from these and previous surveys will be disseminated in many ways, including bee identification workshops, the state species list of bees, and public outreach activities.

Bees and other animals pollinate an estimated 78% of plants in temperate ecosystems¹—thereby supporting native plant communities that store carbon, prevent soil erosion, and provide food and shelter for wildlife. Bees are sentinels of landscape change, and Minnesota's prairie-forest border is viewed as particularly sensitive to the effects of climate change.² Unfortunately, few wild bee studies have been examined this region, and most counties beyond the metropolitan area are severely under-sampled (see map on page 3).

The Minnesota Biological Survey proposes to address these knowledge gaps by surveying high-quality sites in portions of the Prairie Parkland, Tallgrass Aspen Parklands, and Eastern Broadleaf Forest ecological provinces. These field surveys will gather baseline data on wild bees in the western, central, and southeastern portions of the state. By augmenting information collected through MBS's initial ENRTF-funded bee surveys (M.L. 2014-6a Wild Bee Surveys in Prairie-Grassland Habitats), these data will enable future assessments of the impacts of landscape change on the diversity and distribution of Minnesota's bee fauna.

The welfare of Minnesota's pollinators has inspired a passionate audience that is eager to learn more and participate in pollinator conservation. To date, MBS's successful education efforts have provided easily-accessible information and facilitated communication concerning Minnesota's pollinators. These efforts include the development of DNR pollinator webpages and a draft document of Pollinator Resource Values for Upland & Wetland Prairies.³ Additional efforts include co-leading a pollinator networking group, collaborating on an expert-guided bee identification workshop, and conducting numerous public outreach presentations. MBS proposes to continue and enhance these educational and collaborative opportunities through a state list of wild bees, identification workshops, and public outreach activities.

II. PROJECT ACTIVITIES AND OUTCOMES

Activity 1: Wild Bee Surveys in Prairies and the Prairie-Forest Border Region

Budget: \$589,332

Surveys of wild bee and associated flowering plants will continue on a subset of high-quality native prairie sites in the Prairie Parkland and Tallgrass Aspen Parkland Provinces that were surveyed in MBS's previous grant (M.L. 2014-6a Wild Bee Surveys in Prairie-Grassland Habitats). Collected data will document annual variability of bee fauna and establish a baseline from which to assess the effects of future environmental change. Surveys will begin in forested and open habitats within the Eastern Broadleaf Forest Province. Surveys will continue through the active foraging period to maximize the diversity of species documented. Data will be evaluated in the context of phenology and landscape characteristics.

¹ Ollerton, J., Winfree, R., & Tarrant, S. (2011). How many flowering plants are pollinated by animals?. *Oikos*, 120(3), 321-326.

² Frelich, L.E., & Reich, P.B. (2010). Will environmental changes reinforce the impact of global warming on the prairie-forest border of central North America?. *Frontiers in Ecology and Environment*, 8(7), 371-378.

³ Minnesota Biological Survey. (2014). Pollinator Resource Values for Upland and Wetland Prairies. http://www.dnr.state.mn.us/pollinator_resources/index.html



Outcome	Completion Date
1. Selection of up to 20 native prairie sites in the prairie region	July 2016
2. Selection of up to 45 survey sites in the Eastern Broadleaf Forest Province	March 2017
3. Field surveys of wild bees and associated plant species	June 2019
4. Data entry, specimen preparation, and delivery of specimens to museum collections	June 2019
5. Summarize findings, add to state species list, and distribute to partners	June 2019

Activity 2: Continuation of Pollinator Education and Outreach

Budget: \$118,032

The Minnesota Biological Survey will continue to develop summary documents on native bees and collaborate with state pollinator partners to enhance information exchange among agencies, professionals, nonprofit organizations, and private citizens. Documents will include an updated state list of bees and dedicated DNR webpages. Outreach activities will include collaborative bee identification workshops to increase technical expertise and foster networking among bee researchers. MBS will also conduct presentations for school groups, nonprofit organizations, and other community groups.

Outcome	Completion Date
1. Compile data and develop summary products and graphics on wild bees	December 2018
2. Collaborate with state pollinator partners to host bee identification workshops	March 2019
3. Conduct public outreach activities	Ongoing

III. PROJECT STRATEGY

A. Project Team/Partners

Crystal Boyd, lead worker, has researched wild bees with the Minnesota Biological Survey since 2013. MBS will partner with Dr. Marla Spivak’s lab, the new pollinator professor Dr. Dan Cariveau, and other staff at the University of Minnesota to co-lead bee identification workshops (Activity 2). The University of Minnesota may contribute grant funds towards the workshops, if received. This request does not include funding for the following partners: MNDNR Fish and Wildlife, MNDNR Parks and Trails, University of Minnesota (including Department of Entomology, Insect Collection, and Cedar Creek Natural History Area), and The Nature Conservancy. This request complements pollinator proposals submitted by Dr. Marla Spivak, Dr. Dan Cariveau, and Dr. David Moeller.

B. Project Impact and Long-Term Strategy

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 it will serve as the foundation on which to build such a data set. Continuation of surveys in prairie-grasslands and expansion of surveys into forested habitats will enable analysis of wild bee distribution within a landscape context. Additionally, extending bee surveys to the Laurentian Mixed Forest would further increase our knowledge about the state’s bee fauna.

C. Timeline Requirements

This proposal intends to obtain information on the bee fauna of Minnesota’s prairie-forest habitats within the 3-year timeframe. By the end of the grant period, we expect to produce baseline data on the diversity and distribution of wild bee species in this region and to further our understanding of bees associated with prairie-grassland and forest habitats.

2016 Detailed Project Budget

Project Title: Wild Bee Surveys in Minnesota's Prairie-Forest Habitats

IV. TOTAL ENRTF REQUEST BUDGET: 3 years

<u>BUDGET ITEM</u>	<u>AMOUNT</u>
Personnel:	\$ 523,000
A. Zoologist/Project Manager (1 position) - (81% salary, 19% benefits); 100% FTE for 3 years	\$ 210,000
B. Zoology Data Manager (1) - (70% salary, 30% benefits); 10% FTE for 3 years	\$ 26,000
C. Entomologist (1) - (70% salary, 30% benefits); 50% FTE for 3 years	\$ 87,000
D. Botanists (2) - (70% salary, 30% benefits); 50% FTE for 3 years	\$ 174,000
E. Graphics/Web Design Specialist (1) - (70% salary, 30% benefits); 10% FTE for 3 years	\$ 26,000
Professional/Technical/Service Contracts:	\$ 9,000
A. Instructor fees for workshops	\$ 9,000
Equipment/Tools/Supplies:	\$ 29,500
A. Field supplies needed to conduct surveys, including GPS units, maps, data recorders, cameras, traps, nets, collecting containers, first-aid and safety equipment.	\$ 8,000
B. Specimen preparation and storage supplies, including pins, pinning boards, specimen drier, cabinets, drawers, unit trays, and microscopes.	\$ 15,000
C. Data compilation and storage, including Fleet lease of computers and external hard drives.	\$ 4,500
D. Outreach supplies needed to conduct public presentations, including specimen boxes, magnifying glasses, tabletop displays, and education kits.	\$ 2,000
Acquisition (Fee Title or Permanent Easements):	N/A
Travel:	\$ 110,000
A. Mileage, lodging, and meals for travel to conduct field surveys of bees	\$ 100,000
B. Mileage, lodging, and meals for instructor travel to workshops and outreach events	\$ 10,000
Additional Budget Items:	\$ 35,864
A. Printing costs for workshops and outreach	\$ 1,200
B. *Direct and Necessary expenses: HR Support (~\$11,786), Safety Support (~\$2,778), Financial Support (~\$9,418), Communication Support (~\$1,236), IT Support (~\$8,382), Planning Support (~\$829), and Procurement Support (~\$235) necessary to accomplishing funded programs/projects.	\$ 34,664
TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND \$ REQUEST =	\$ 707,364

V. OTHER FUNDS *(This entire section must be filled out. Do not delete rows. Indicate "N/A" if row is not applicable.)*

<u>SOURCE OF FUNDS</u>	<u>AMOUNT</u>	<u>Status</u>
Other Non-State \$ To Be Applied To Project During Project Period:	N/A	N/A
Other State \$ To Be Applied To Project During Project Period:		
10% salary, Minnesota Biological Survey - Animal Survey Supervisor	\$ 28,000	Secured
In-kind Services To Be Applied To Project During Project Period:	N/A	N/A
Funding History:		
\$370,000 - ENRTF for ML 2013-6a "Wild Bee Surveys in Prairie-Grassland Habitats"	\$ 370,000	
Remaining \$ From Current ENRTF Appropriation:		
\$113,300 remaining from ML 2016-6a "Wild Bee Surveys in Prairie-Grassland Habitats"	\$ 113,300	Unobligated
\$190,400 remaining from ML 2016-6a "Wild Bee Surveys in Prairie-Grassland Habitats"	\$ 190,400	Legally Obligated

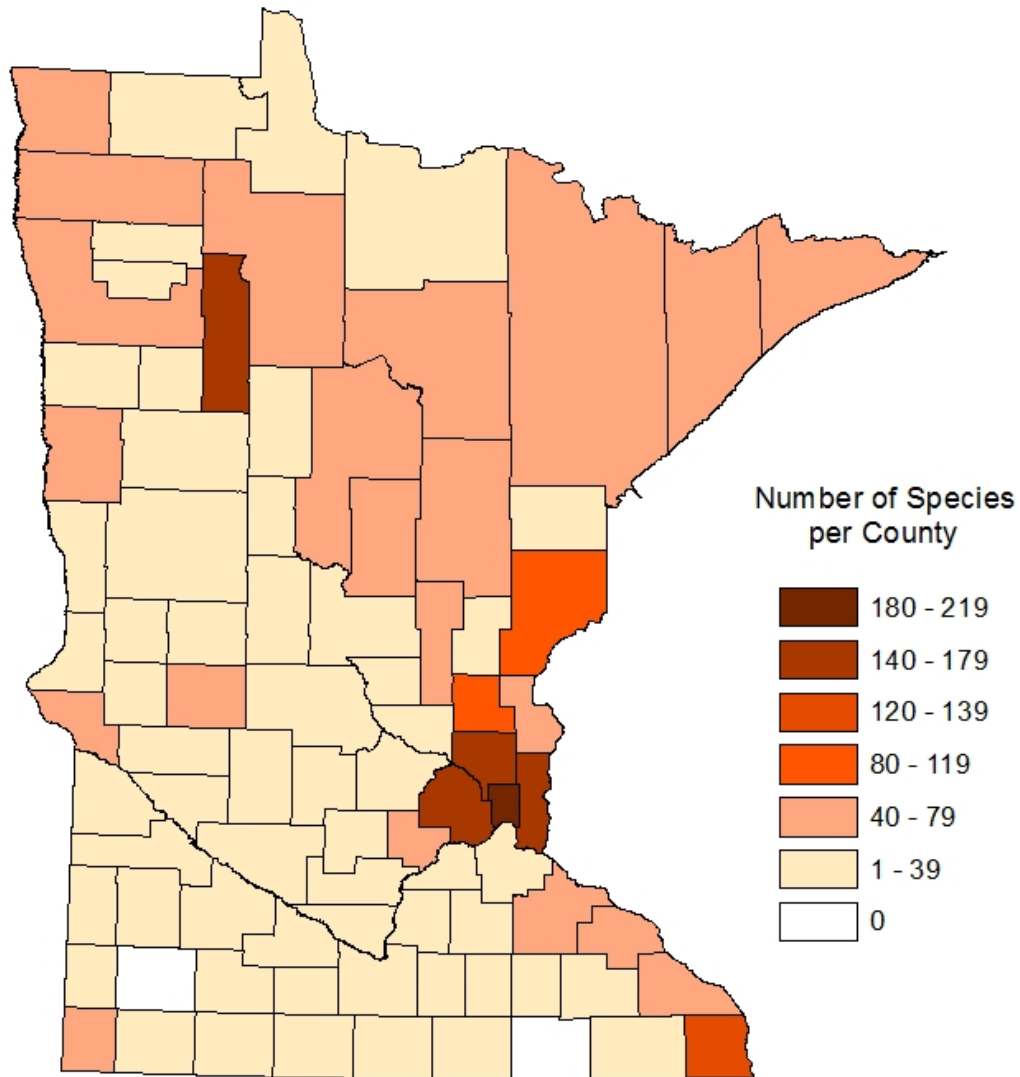


Attachment 1.

Number of bee species recorded per county, based on museum specimens as of January 1, 2015

Number of collections represented: 1

Total number of specimens examined: ~27,000



These data were compiled by the DNR's Minnesota Biological Survey through the grant M.L. 2013-6a "Wild Bee Surveys in Prairie-Grassland Habitats."

Funding for this project was provided by the Minnesota Environment and Natural Resources Trust Fund as recommended by the Legislative-Citizen Commission on Minnesota Resources (LCCMR).





Environment and Natural Resources Trust Fund (ENRTF)

2016 Main Proposal

Project Title: Wild Bee Surveys in Minnesota’s Prairie - Forest Habitats

Project Manager Qualifications

Project Manager: Crystal Boyd, Bee Researcher and Natural Resources Specialist
 Affiliation: Department of Natural Resources, Minnesota Biological Survey
 Mailing Address: 500 Lafayette Road, Box 25, St. Paul, MN 55155-4025
 Telephone: 651-259-5699
 Email: crystal.boyd@state.mn.us

Crystal Boyd has conducted insect surveys for the Minnesota Department of Natural Resources since 2012. She coordinates day-to-day activities for the Minnesota Biological Survey’s native bee program, which aims to document and interpret the distribution of native bee species in Minnesota. To that end, surveys have been conducted in native prairie habitats and restored grasslands. She is currently working on an updated state species list of Minnesota’s bees.

Work Experience

2012 – present Bee Researcher and Natural Resources Specialist, Minnesota Biological Survey, DNR
 2011 – 2012 Junior Scientist, University of Minnesota Insect Collection
 2004 – 2012 (seasonal) Mosquito Inspector, Metropolitan Mosquito Control District
 2009 – 2011 Curatorial Assistant for insect collection, University of Colorado Museum of Natural History
 2011 Insect Biodiversity Analyst, University of Minnesota Insect Collection
 2011 Collections Management Intern, USFWS National Wildlife Property and Eagle Repository
 2009 Aquatic Invertebrates Program Intern, Science Museum of Minnesota
 2008 Community Partnerships Intern, Minnesota Children’s Museum
 2005 – 2006 Tour Guide, J.F. Bell Museum of Natural History, University of Minnesota
 2005 – 2006 Undergraduate Research Assistant, Lepidoptera (moths), Department of Entomology, University of Minnesota
 2003 – 2004 Undergraduate Research Assistant, Diptera (midges), Department of Entomology, University of Minnesota

Education

2011 Master of Science, Museum and Field Studies. University of Colorado, Boulder, CO. Thesis: The Bumblebees of Colorado.
 2007 Bachelor of Arts, English and Spanish. Minor in entomology. University of Minnesota, Minneapolis, MN. Thesis: Literary Darwinism: The Viable Offspring of Evolutionary Psychology and Literary Studies.

Project Responsibilities

Crystal Boyd will provide overall project direction. In her capacity as MBS Bee Researcher, she has demonstrated her ability to manage budgets, direct staff and volunteers, coordinate with partners, and prepare project workplans, updates, and reports.

Organization Description

The Minnesota Biological Survey systematically collects, interprets, and delivers baseline data on the distribution and ecology of native animals, plants, plant communities, and functional landscapes. Delivery of these data helps guide management, conservation, and monitoring of critical habitat and ecological functions.