



Environment and Natural Resources Trust Fund (ENRTF) M.L. 2016 Work Plan

Date of Report: May 29, 2016

Date of Next Status Update Report: December 31, 2016

Date of Work Plan Approval: June 7, 2016

Project Completion Date: June 30, 2019

Does this submission include an amendment request? No

PROJECT TITLE: Native Bee Surveys in Minnesota Prairie and Forest Habitats

Project Manager: Crystal Boyd

Organization: Minnesota Department of Natural Resources

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Location: 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, Waseca, Washington, Watonwan, Wilkin, Winona, Wright, Yellow Medicine

Total ENRTF Project Budget:

ENRTF Appropriation: \$600,000

Amount Spent: \$0

Balance: \$600,000

Legal Citation: M.L. 2016, Chp. 186, Sec. 2, Subd. 03b

Appropriation Language:

\$600,000 the second year is from the trust fund to the commissioner of natural resources to continue to assess the current status and distribution of native bee pollinators in Minnesota by expanding surveys into the prairie-forest border region and facilitating interagency collaboration and public outreach on pollinators. This appropriation is available until June 30, 2019, by which time the project must be completed and final products delivered.

I. PROJECT TITLE: Native Bee Surveys in Minnesota Prairie and Forest Habitats

II. 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 multiple 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 examined this region, and most counties beyond the metropolitan area are severely under-sampled (see map in Section IX).

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, northwestern, 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 efforts through a state list of wild bees, identification workshops, and public outreach activities.

III. OVERALL PROJECT STATUS UPDATES:

Project Status as of December 31, 2016:

Project Status as of July 31, 2017:

Project Status as of December 31, 2017:

Project Status as of July 31, 2018:

Project Status as of December 31, 2018:

Overall Project Outcomes and Results:

IV. PROJECT ACTIVITIES AND OUTCOMES:

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

ACTIVITY 1: Native Bee Surveys in Minnesota Prairie and Forest Habitats

Description:

Surveys of wild bees 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.

Approach:

Prairie and forest sites will be selected in the Minnesota Prairie Region and Eastern Broadleaf Forest Province. Bee trap transects will be run repeatedly at each site from April through October in prairie sites or until leaf out in forest sites to maximize diversity. All bees* collected will be identified and entered into the bee database with associated habitat information. Voucher specimens will be prepared for each species at each site and submitted to the University of Minnesota Insect Collection.

*Bees targeted include members of six bee families in the subgroup Anthophila (order Hymenoptera). Hymenoptera not targeted by this project include wasps, hornets, ants, and sawflies. Individuals from these groups and other insects and arachnids captured during the survey will be collected and retained for a period of time for future investigations.

Summary Budget Information for Activity 1:

ENRTF Budget: \$ 505,478
Amount Spent: \$ 0
Balance: \$ 505,478

Outcome	Completion Date
1. Selection of up to 15 native prairie sites in the prairie region	July 2016
2. Selection of up to 35 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 Status as of December 31, 2016:

Activity Status as of July 31, 2017:

Activity Status as of December 31, 2017:

Activity Status as of July 31, 2018:

Activity Status as of December 31, 2018:

Final Report Summary:

ACTIVITY 2: Continuation of Pollinator Education and Outreach

Description:

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 species list of bees and dedicated DNR webpages. Outreach activities will include collaborative bee identification workshops that increase

technical expertise and foster networking among bee researchers. MBS will also conduct presentations for school groups, nonprofit organizations, and other community groups.

Approach:

Publications, presentations, and web-based products will be developed to provide information to a variety of audiences. A webpage on wild bees will continue to be supported within the MNDNR’s Minnesota Biological Survey website (<http://www.dnr.state.mn.us/mbs/index.html>). This webpage will include updates on project activities and findings, provide a state species list of bees in Minnesota, and link to the MNDNR Nongame Wildlife Program and other external websites that feature bees. Bee identification workshops will be organized in collaboration with the University of Minnesota and other partners. The project’s coordinator will respond to inquiries about bees and requests to participate in symposia, give presentations, and provide information for news reports and articles.

Summary Budget Information for Activity 2:

ENRTF Budget: \$ 94,522
Amount Spent: \$ 0
Balance: \$ 94,522

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

Activity Status as of December 31, 2016:

Activity Status as of July 31, 2017:

Activity Status as of December 31, 2017:

Activity Status as of July 31, 2018:

Activity Status as of December 31, 2018:

Final Report Summary:

V. DISSEMINATION:

Description:

Data collected from this project will be stored in the Minnesota Department of Natural Resources (MNDNR), Division of Ecological and Water Resources information system. This information will take the form of databases, GIS layers, maps, and web-based summaries. It will be linked to other databases within the MNDNR and will be shared with our partners working on separate bee and pollinator projects.

Coordination and information exchange with other pollinator groups and projects will strengthen our knowledge of Minnesota’s pollinators and identify additional needs for conservation and management. These collaborators include, but are not limited to:

- MNDNR Pollinator Habitat Project
- University of Minnesota (UM) Bee Squad
- Enhancing Pollinator Landscapes (UM, 2014 ENRTF 146-F)
- Minnesota Pollinator Partnership (Pheasants Forever, 2014 ENRTF 072-C)
- Protecting Bees by Understanding Systemic Insecticides (UM, 2014 ENRTF 151-F)
- Minnesota Native Bee Atlas: A Citizen Science Project (UM, 2015 ENRTF 011-A)

- Effects of Grazing Versus Fire for Prairie Management (UM, 2015 ENRTF 009-A)
- Prairie Butterfly Conservation, Research and Breeding Program (MN Zoological Garden and MNDNR, 2014 ENRTF 017-A and 2016 ENRTF 017-A)
- Statewide Monitoring Network for Minnesota's Changing Habitats (MNDNR, ENRTF 2016 004-A)
- Data Driven Pollinator Conservation (UM, 2016 ENRTF 003-A)
- Bee Pollinator Habitat Enhancement (UM, 2016 ENRTF 155-F)
- Measuring Prairie Fragment Connectivity: Pollen and Seed Dispersal (UM, 2016 ENRTF 162-F)
- Seeding Between the Lines: Permanent Habitat Within Rowcrops (Science Museum of Minnesota, 2016 ENRTF 154-F)

Physical collections of bees will be prepared and deposited into the Insect Collection at the University of Minnesota. Plant collections will be deposited into the J.F. Bell Museum of Natural History's Herbarium. Data associated with bee specimens will be stored in the MNDNR Observation Database. Data associated with plant county records will be reported to MNDNR's checklist of vascular plant species, MNTaxa.

Status as of December 31, 2016:

Status as of July 31, 2017:

Status as of December 31, 2017:

Status as of July 31, 2018:

Status as of December 31, 2018:

Final Report Summary:

VI. PROJECT BUDGET SUMMARY:

A. ENRTF Budget Overview:

Budget Category	\$ Amount	Overview Explanation
Personnel:	\$ 410,000	1 project manager at 100% FTE each year for 3 years (\$210,000); 1 data manager at 5% FTE each year for 3 years (\$13,000); 1 entomologist at 50% FTE each year for 3 years (\$87,000); 1 botanist at 50% FTE each year for 3 years; 1 graphics/web designer at 5% FTE each year for 3 years (\$13,000).
Professional/Technical/Service Contracts:	\$ 9,000	1 contract for workshop instructor TBD through competitive bid.
Equipment/Tools/Supplies:	\$ 35,156	Field supplies needed to conduct surveys, including GPS units, maps, data recorders, cameras, traps, nets, collecting containers, and first-aid and safety equipment (~\$8,000). Specimen preparation and storage supplies, including pins, pinning boards, specimen driers, cabinets, drawers, unit trays, and microscopes (~\$20,656). Data compilation and storage, including Fleet lease of computers and external hard drives (~\$4,500). Outreach supplies needed to conduct public presentations, including specimen boxes, magnifying glasses, tabletop displays, and education kits (~\$2,000).
Printing:	\$ 1,200	Printing of handouts, workbooks, and identification guides for workshops and outreach presentations.
Travel Expenses in MN:	\$ 110,000	Travel to conduct field surveys of bees. Mileage: \$57,000. Lodging: \$15,000. Meals: \$28,000. Travel for instructor to conduct workshops and outreach events. Mileage: \$3,600. Lodging: \$4,500. Meals: \$1,900.
Other:	\$ 34,644	Direct and necessary costs: 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.
TOTAL ENRTF BUDGET:	\$ 600,000	

Explanation of Use of Classified Staff: N/A

Explanation of Capital Expenditures Greater Than \$5,000: N/A

Number of Full-time Equivalents (FTE) Directly Funded with this ENRTF Appropriation: 6.3 FTEs

Number of Full-time Equivalents (FTE) Estimated to Be Funded through Contracts with this ENRTF Appropriation: N/A

B. Other Funds:

Source of Funds	\$ Amount Proposed	\$ Amount Spent	Use of Other Funds
Non-state	N/A	N/A	N/A
State			
Heritage Enhancement	\$9,500	\$ 0	MBS Animal Survey Supervisor -- project management guidance and support.
TOTAL OTHER FUNDS:	\$9,500	\$ 0	

VII. PROJECT STRATEGY:**A. Project 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 and Dr. Dan Cariveau.

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 of the state's bee fauna.

C. Funding History:

Funding Source and Use of Funds	Funding Timeframe	\$ Amount
Environment and Natural Resources Trust Fund – M.L. 2014, Ch. 226, Sec. 2, Subd. 05(i): Appropriation of cash funds used to conduct previous native bee surveys in the prairie region.	July 1, 2014 – June 30, 2016	\$ 370,000
RIM Critical		\$24,000

VIII. FEE TITLE ACQUISITION/CONSERVATION EASEMENT/RESTORATION REQUIREMENTS:

A. Parcel List: N/A

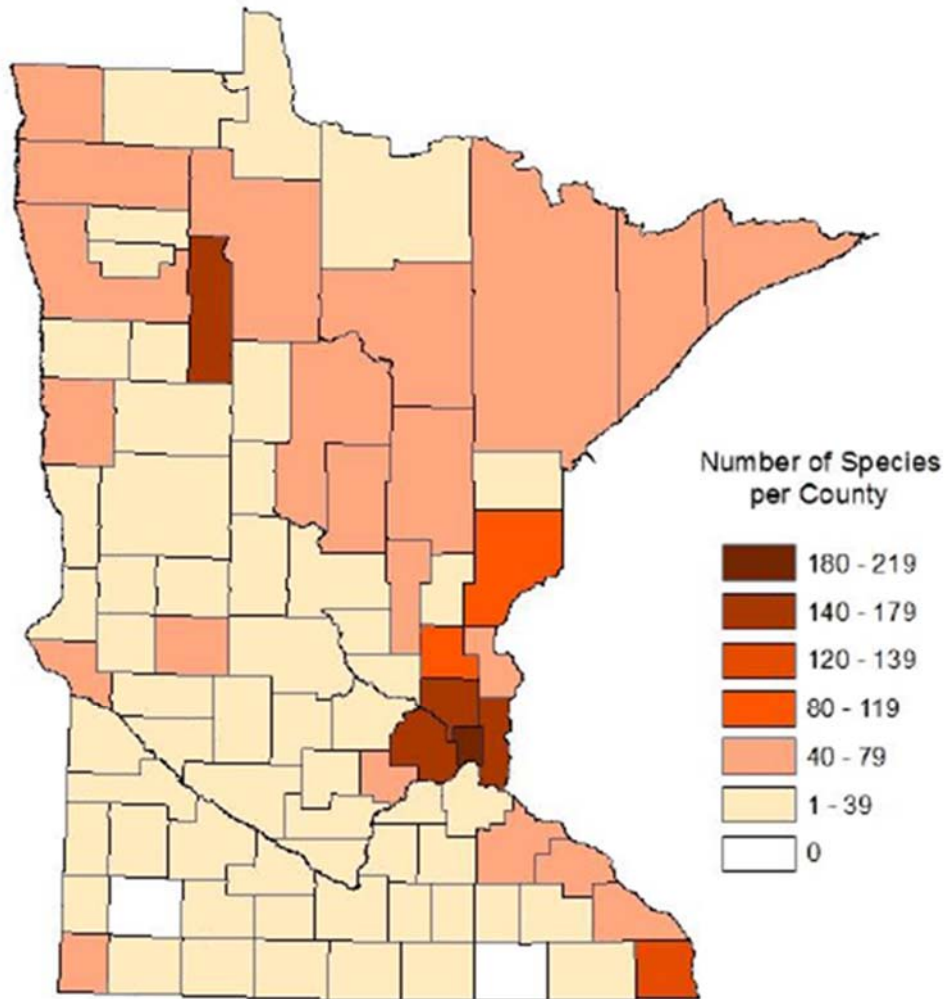
B. Acquisition/Restoration Information: N/A

IX. VISUAL COMPONENT or MAP(S):

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).



X. RESEARCH ADDENDUM: N/A

XI. REPORTING REQUIREMENTS:

Periodic work plan status update reports will be submitted no later than December 31 2016, July 31 2017, December 31 2017, July 31 2018, and December 31 2018. A final report and associated products will be submitted between June 30 and August 15, 2019.

**Environment and Natural Resources Trust Fund
M.L. 2016 Project Budget**



Project Title: Native Bee Surveys in Minnesota Prairie and Forest Habitats

Legal Citation: M.L. 2016, Chp. 186, Sec. 2, Subd. 03b

Project Manager: Crystal Boyd

Organization: Minnesota Department of Natural Resources

M.L. 2016 ENRTF Appropriation: \$ 600,000

Project Length and Completion Date: 3 Years, June 30, 2019

Date of Report: May 29, 2016

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET	Activity 1 Budget	Amount Spent	Activity 1 Balance	Activity 2 Budget	Amount Spent	Activity 2 Balance	TOTAL BUDGET	TOTAL BALANCE
BUDGET ITEM	Native Bee Surveys			Pollinator Education and Outreach				
Personnel (Wages and Benefits)								
Crystal Boyd, Zoologist/Project Manager: \$210,000 (81% salary, 19% benefits); 100% FTE each year for 3 years	\$168,000	\$0	\$168,000	\$42,000	\$0	\$42,000	\$210,000	\$210,000
1 Zoology Data Manager: \$13,000 (70% salary, 30% benefits); 5% FTE each year for 3 years	\$13,000	\$0	\$13,000				\$13,000	\$13,000
1 Entomologist: \$87,000 (70% salary, 30% benefits); 50% FTE each year for 3 years	\$87,000	\$0	\$87,000				\$87,000	\$87,000
1 Botanist: \$87,000 (70% salary, 30% benefits); 50% FTE each year for 3 years	\$87,000	\$0	\$87,000				\$87,000	\$87,000
1 Graphics/Web Design Specialist: \$13,000 (70% salary, 30% benefits); 5% FTE each year for 3 years				\$13,000	\$0	\$13,000	\$13,000	\$13,000
Professional/Technical/Service Contracts								
TBD (competitive bid): Classroom instructor to lead native bee identification workshops.				\$9,000	\$0	\$9,000	\$9,000	\$9,000
Equipment/Tools/Supplies	\$33,156	\$0	\$33,156	\$2,000	\$0	\$2,000	\$35,156	\$35,156

Field supplies needed to conduct surveys, including GPS units, maps, data recorders, cameras, traps, nets, collecting containers, first-aid and safety equipment (~\$8,000). Specimen preparation and storage supplies, including pins, pinning boards, specimen drier, cabinets, drawers, unit trays, and microscopes (~\$20,656). Data compilation and storage, including Fleet lease of computers and external hard drives (~\$4,500). Outreach supplies needed to conduct public presentations, including specimen boxes, magnifying glasses, tabletop displays, and education kits (~\$2,000).								
Printing								
Printing of handouts, workbooks, and identification guides for workshops and outreach				\$1,200	\$0	\$1,200	\$1,200	\$1,200
Travel expenses in Minnesota								
Travel to conduct field surveys of bees. Mileage: \$57,000. Lodging: \$15,000. Meals: \$28,000.	\$100,000	\$0	\$100,000				\$100,000	\$100,000
Travel for instructor to conduct workshops and outreach events. Mileage: \$3,600. Lodging: \$4,500. Meals: \$1,900.				\$10,000	\$0	\$10,000	\$10,000	\$10,000
Other								
Direct and necessary costs: 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.	\$17,322	\$0	\$17,322	\$17,322	\$0	\$17,322	\$34,644	\$34,644
COLUMN TOTAL	\$505,478		\$505,478	\$94,522		\$94,522	\$600,000	\$600,000

