

## **M.L. 2019 Project Abstract**

For the Period Ending June 30, 2023

**PROJECT TITLE:** Native Bee Survey

**PROJECT MANAGER:** Jessica Petersen

**AFFILIATION:** Minnesota Department of Natural Resources

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**FUNDING SOURCE:** Environment and Natural Resources Trust Fund

**LEGAL CITATION:** M.L. 2019, First Special Session, Chp. 4, Art. 2, Subd. 03s as extended by M.L. 2022, Chp. 94, Sec. 2, Subd. 19 (c.1) [to June 30, 2023]

**APPROPRIATION AMOUNT:** \$600,000

**AMOUNT SPENT:** \$599,992

**AMOUNT REMAINING:** \$8

### **Sound bite of Project Outcomes and Results**

This project greatly expanded the conservation status of bees in the Laurentian Mixed Forest. We identified 255 species from 9,000 specimens. We made five new state records including one new record for the United States, many new county records, and new plant associations. From these data we will build a list of species in need of conservation.

### **Overall Project Outcome and Results**

Prior to this project, very little was known about bees in the boreal forests in Minnesota. We collected 9,300 bees at 193 sites in the Laurentian Mixed Forest (LMF) ecological province. Over 90% of those specimens have been identified as to species, resulting in 255 species. This project accounts for 68% of the total known specimens collected from the LMF. Nearly all specimens collected are permanently housed in the University of Minnesota Insect Collection in St. Paul for all Minnesotans to utilize. Plant-associations are often lacking for bees, and knowing this information will aid in protecting the habitat they use. We made 2,400 connections between bee species and plants. We added five new species to the state list, including one species that had not been recorded from the United States. Many new county records, range extensions, and new plant associations were documented. These data have been published in the Minnesota DNR Natural Heritage Information System database and are accessible to all Minnesotans. The associated report detailing the results of this LMF survey and the previous surveys in Minnesota will be posted on the [MNDNR website](#) devoted to this project. We delivered project results and outreach materials at over 30 events, reaching thousands of Minnesotans. The culmination of this project and the two other LCCMR MBS bee survey grants was a publication in *Zootaxa* co-authored with the Cariveau Native Bee Lab describing the diversity of bees in Minnesota. These data will be used to inform conservation status rankings for bees in Minnesota in the upcoming year as the state threatened and endangered list and the Minnesota Wildlife Action plan are slated to be updated.

### **Project Results Use and Dissemination**

We produced a full report of this project that is shared with LCCMR to accompany the workplan update. We created a handout/flier that will also be shared that describes some specialist bees and their host plants. Specimens at the University of Minnesota Insect Collection that were collected through this project are available. A collaborative journal article was published in *Zootaxa* (Portman et al. 2023) that lists the bees of Minnesota. We shared results of this project at over 30 public events to thousands of people.



# Environment and Natural Resources Trust Fund (ENRTF)

## M.L. 2019 ENRTF Work Plan Final Report (Main Document)

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**Today's Date:** August 15, 2023

**Final Report**

**Date of Work Plan Approval:** June 17, 2019

**Project Completion Date:** June 30, 2023

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**PROJECT TITLE:** Native Bee Survey

**Project Manager:** Jessica Petersen

**Organization:** Minnesota Department of Natural Resources

**College/Department/Division:** Division of Ecological and Water Resources

**Mailing Address:** 500 Lafayette Road

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**Location:** Aitkin, Beltrami, Carlton, Cass, Chisago, Clearwater, Cook, Crow Wing, Hubbard, Itasca, Kanabec, Koochiching, Lake, Lake of the Woods, Mille Lacs, Pine, St. Louis, and Wadena Counties.

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**Total Project Budget:** \$600,000

**Amount Spent:** \$599,992

**Balance:** \$8

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**Legal Citation:** M.L. 2019, First Special Session, Chp. 4, Art. 2, Subd. 03s as extended by M.L. 2022, Chp. 94, Sec. 2, Subd. 19 (c.1) [to June 30, 2023]

**Appropriation Language:**

\$600,000 the first 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 coniferous-deciduous forest region of Minnesota and facilitating interagency collaboration and public outreach on pollinators.

M.L. 2022 - Sec. 2. ENVIRONMENT AND NATURAL RESOURCES TRUST FUND; EXTENSIONS. [to June 30, 2023]

## **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. OVERALL PROJECT STATUS UPDATES:**

### **First Update March 1, 2020**

We have coordinated with the Xerces Society to plan to host three bee identification and monitoring workshops.

This fall MBS staff have worked to inform partners about our upcoming field season including internal and external groups that work in the areas where we will be surveying. Our focus areas for 2020 will be sites around Bemidji, Grand Rapids, and Mora. We are aiming for eight sites to sample using bowl traps in each focus area, layering monitoring for bees at established Ecological Monitoring Network sites, and meandering from targeted plant communities we might be missing.

Approximately 42,200 bee specimens have been pinned, labeled, and databased since this project began in 2015. Of these specimens 76% are identified to species, and 24% are identified to genus. A taxonomist has confirmed 65% of the specimens.

### **Second Update September 1, 2020**

Over the spring and summer we have worked to adjust our sampling to maximize the survey while balancing covid-19 related mandates. Although there was a delay to the start of the field season, we were able to hire one additional technician and survey the LMF for bees. Thus far we have successfully conducted over 200 sampling

events across 14 counties since June. We were able to retain the sampling focus areas around Bemidji and Mora and shifted the Grand Rapids work to the east and south to accommodate day trips. During the reporting period we authored two publications that acknowledge the efforts of this project. We continue to work to enter data into the MNDNR database.

**Third Update March 1, 2021**

We have processed all 4500 specimens collected in 2020 with permanent locality labels, preliminarily identified them all to genus and some to species (e.g., *Bombus*), and entered all associated data into the DNR database. Planning for the 2021 field season has begun. We plan to focus our efforts in St. Louis, Cook, and Lake Counties. Our work was highlighted in one news article and we presented at a national meeting on invertebrate conservation by state agencies. In January, we submitted our annual report to the USFWS required for our rusty patched bumble bee recovery permit and assisted with other DNR activities surrounding bumble bee monitoring. We are drafting an article for publication on the state species list of bees for Minnesota with the University of Minnesota Bee Lab. Lastly, we have been engaged with regional bee experts to draft a list of bee species of greatest conservation need.

**Fourth Update September 1, 2021**

We were not able to hire an additional technician this season due to covid-19 restrictions. This spring bee surveys begun in the LMF with our efforts focused in St. Louis, Cook, and Lake Counties. Thus far we have completed over 145 sampling events across 10 counties since April, 2021. We have focused our work on handnetting bees from flowers, thus greatly increasing our understanding of plant-bee associations. Specimen processing is underway and we are working on entering data into the MNDNR database. During the reporting period our work was highlighted in a radio interview and several social media posts.

**Fifth Update March 1, 2022**

We have processed all 1,600 bee specimens that were caught with hand nets and the processing of the bowl trap specimens is underway. Preliminarily identifications and entering data into the DNR database is ongoing. Planning and hiring for the 2022 field season has begun. We are working with Xerces Society to plan three bee identifications workshops this summer. In January, we submitted our annual report to the USFWS required under our rusty patched bumble bee recovery permit. We have participated in meetings with USFWS to develop activities for the Recovery Implementation Strategy of the rusty patched bumble bee. Lastly, we are on the final stages of drafting a publication of the Bees of Minnesota with University of Minnesota Bee Lab.

**Update as of June 30, 2022:**

Project extended to June 30, 2023 by LCCMR 6/30/22 as a result of M.L. 2022, Chp.94, Sec. 2, Subd. 19, legislative extension criteria being met.

**Amendment Request as of August 31, 2022:**

Travel, equipment, and supplies all came in under budget and we would like to spend this on more subject matter expertise for bee identifications by shifting \$10,000 in funds to contracts to further support the necessary taxonomy work and \$53,090 to personnel.

Reduce Travel by \$52,020 and move as follows:

- Increase Contracts with UMN by \$10K
- Increase Salary by \$42,020

Reduce field Equipment by \$3,950 and Equipment Specimens by \$7,120 and move the entire amount, \$11,070, to Salary.

We would also request to extend the completion dates in the activity tables to 2023 to align outcome ends dates with the project end date. We have completed two outcomes (Activity 1, Outcome 1 and Activity 2, Outcome2) and thus changed the completion dates to September 2022.

### **Amendments approved by LCCMR 12/6/2022**

#### **Sixth Update as of September 1, 2022:**

We hired a technician to assist with bee surveys in the LMF this season. Our focus this season has been to fill in geographical gaps and get better coverage for the LMF. Over 163 survey events have been completed across 14 counties. Specimen processing is underway and we are working on entering data into the MNDNR database. A total of 4 bee identification and monitoring workshops were hosted with Xerces Society at state parks.

#### **Amendment Request as of March 1, 2023:**

To correct a negative in Equipment/Tools/Supplies - Specimen preparation and storage supplies, we are requesting to reallocate funding. This negative is due to an accounting error from previous reporting periods that was discovered during this budget update. Personnel and the contract with Xerces came in under budget.

- Move \$100 from DNR non-competitive sole-source Xerces contract to Specimen Preparation and storage supplies.
- Move \$362 from Personnel to Specimen Preparation and storage supplies.

We are also requesting to reallocate funding to account for additional contract needs with UMN per DNR-UMN Master Contract for entomological technical services. No additional travel is planned on this grant and Personnel is coming in under budget.

- Move \$2,253 from Personnel to Contracts with UMN per DNR-UMN Master Contract.
- Move \$2,455 from Travel to Contracts with UMN per DNR-UMN Master Contract.

### **Amendment approved by LCCMR 3/17/2023**

#### **Seventh Update as of March 1, 2023:**

We pinned, identified to genus and some specimens to species, and databased all 2,100 bees collected in 2022. All specimens are now with Dr. Zach Portman for final identification and review. We have entered nearly all specimen identifications from the 2020 and 2021 seasons (6600 out of 7000) and are beginning to summarize the results of the bee survey by updating DNR websites and disseminating the results of the statewide bee survey through media outlets.

#### **Amendment request as of June 30, 2023**

We request two final budget adjustments to reconcile end of project accounting:

- Decrease personnel by \$333 from \$498,183 to \$497,850
- Increase travel by \$333 from \$20,525 to \$20,858

### **Amendment approved by LCCMR 10/17/2023**

#### **Final Report as of June 30, 2023 (to be submitted before August 15, 2023):**

Prior to this project, very little was known about bees in the boreal forests in Minnesota. We collected 9,300 bees at 193 sites in the Laurentian Mixed Forest (LMF) ecological province. Over 90% of those specimens have been identified to species, resulting in 255 species. This project accounts for 68% of the total known specimens collected from the LMF. Nearly all specimens collected are permanently housed in the University of Minnesota Insect Collection in St. Paul for all Minnesotans to utilize. Plant-associations are often lacking for bees. Knowing

this information will aid in protecting the habitat they use. We made 2400 connections between bee species and plants. We added five new species to the state list, including one species that had not been recorded from the United States. Many new county records, range extensions, and new plant associations were documented. These data have been published in the Minnesota DNR Natural Heritage Information System database and are accessible to all Minnesotans. The associated report detailing the results of this LMF survey and the previous surveys in Minnesota will be posted on the [MNDNR website](#) devoted to this project. We delivered project results and outreach materials at over 30 events, reaching thousands of Minnesotans. The culmination of this project and the two other LCCMR MBS bee survey grants was a publication in *Zootaxa* co-authored with the Cariveau Native Bee Lab describing the diversity of bees in Minnesota. These data will be used to inform conservation status rankings for bees in Minnesota in the upcoming year as the state threatened and endangered list and the Minnesota Wildlife Action plan are slated to be updated.

### III. PROJECT ACTIVITIES AND OUTCOMES:

#### 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 DNR database with associated habitat information. A taxonomist will confirm specimen identification. Specimens will be accessioned into the University of Minnesota Insect Collection and data included in the collections database.

#### ACTIVITY 1 ENRTF BUDGET: \$558,849

Outcome	Completion Date
1. Field surveys of wild bees and associated plant species at up to 75 sites in the LMF	September 2022
2. Specimen preparation, identification, data entry, and deposition into the Insect Collection	June 2023

#### First Update March 1, 2020

Site selection has begun for the field sampling in 2020. Our goal for 2020 is to decrease our carbon footprint by driving less, spending more time with boots on the ground surveying bees across a variety of habitat types. To this end, we are reaching out to folks that live and work in the areas we will be surveying. In October we took a site scouting trip to the north central region of Minnesota. We have continued to select sites using ArcGIS and communicating with people that know the areas well. We have met with partners within the DNR including the regional wildlife, parks and trails, and ecological and water resources staff and outside partners such as the Chippewa National Forest. All of these interactions have been helpful in finding field sites, establishing relationships in the region, and getting the word out about the upcoming workshops.

Identification, database entry, and identification confirmation are ongoing tasks. Approximately 42,200 bee specimens have been pinned, labeled, and databased since this project began in 2015. Of these specimens 76% are identified to species, and 24% are identified to genus. A taxonomist has confirmed 65% of the specimens. Specimens continue to be accessioned at the University of Minnesota Insect Collection upon final identification confirmation.

#### Second Update September 1, 2020

Identification continued during this reporting period through a contract with University of Minnesota taxonomist, Zach Portman for confirmations of preliminary identifications. Dr. Portman worked through many of the more difficult taxa including specimens of *Melissodes*. These identifications, once entered into the database will help to round out the species we have surveyed to date.

Our primary work during this reporting period has been field surveys. Surveys began in June due to covid-19 restrictions on travel and fieldwork. Since then we have been using a variety of methods including bowl traps, hand netting, and Malaise trapping to survey bees across a wide variety of habitats. Where appropriate, plant species associations and native plant community information has been collected along with bee sampling. Thus far we have surveyed in Aitkin, Beltrami, Carlton, Cass, Chisago, Clearwater, Crow Wing, Hubbard, Itasca, Kanabec, Koochiching, Lake, Mille Lacs, and Pine Counties across over 200 sampling events.

Many of the specimens collected in 2020 have already been pinned and are awaiting permanent labels and identification as soon as the season wraps up.

### **Third Update March 1, 2021**

All specimens have been processed, labelled permanently and entered into the DNR database. We collected roughly 4500 specimens of bees in 2020. We sampled from 24 bowl trap sites, each sampled about five times during the season and resulting in about 1000 specimens and 20 genera. We sampled from 78 sites using meandering handnetting, resulting in 3500 specimens and 31 genera. Because this was our first time sampling in more forested habitats, we tested a Malaise trap that has the potential to passively sample a different subset of the bee community than either bowl traps or hand netting. The Malaise trap was up continuously for 4 weeks, picking up samples and replacing the ethanol weekly. From these samples, we found 40 specimens of bees and 10 genera.

Planning and site selection has begun for the 2021 field season. We have continued to select focus areas using ArcGIS and communicating with people who are familiar with the area. We have met with partners within the DNR and outside partners such as the Superior National Forest.

### **Fourth Update September 1, 2021**

We have been primarily working in the field from April to the present, collecting bees using handnetting and bowl traps. In April, we selected 19 sites to set up transects of bowl traps each with 24 bowls. We have been supplementing the bowl trap samples with handnetting from flowers at a variety of sites in the LMF. Along with the bee specimen itself, handnetting provides the added ecological information of the associated plant species information. In total, we have completed over 145 sampling events in Carlton, Chisago, Cook, Itasca, Kanabec, Koochiching, Lake, Mille Lacs, Pine, and St. Louis Counties.

We have begun to pin and label the 2021 specimens and identification will begin this fall. The taxonomist we contracted through the University of Minnesota, Zach Portman, has continued confirming bee identifications. Dr. Portman has finished approximately half of the specimens we collected in 2020.

### **Fifth Update March 1, 2022**

Dr. Portman has finished with confirming bee identifications from specimens collected in 2020. We are now working on entering those confirmations into our database.

Many of the of specimens caught in 2021 have been processed, labeled, and entered into the DNR database. Identification of these specimens is ongoing. We collected roughly 2,200 bee specimens during the 2021 field season. We sampled at 20 sites with bowl traps resulting in about 600 bee specimens. These specimens are still waiting to be processed, pinned, and labeled before identification begins. We sampled at 73 sites using hand nets resulting in about 1,600 bee specimens. These specimens have been processed, labeled, and identified to genus. We contracted with Dr. Portman to confirm identifications of specimens collected in 2021.

Planning has begun for the 2022 field season. Our focus will be in areas of Northeastern Minnesota that are under surveyed (e.g. Koochiching and Itasca Counties). We are in the process of hiring a field assistant for the 2022 field season.

**Update as of June 30, 2022:**

Project extended to June 30, 2023 by LCCMR 6/30/22 as a result of M.L. 2022, Chp.94, Sec. 2, Subd. 19, legislative extension criteria being met.

**Sixth Update as of September 1, 2022:**

Our primary work during this reporting period has been field surveys, collecting bees using handnetting in a variety of habitats within the LMF. We have been focused on filling in geographic gaps and collecting from plants we have not collected from in the past. Thus far we have completed over 163 sampling events across Aitkin, Beltrami, Carlton, Chisago, Cook, Crow Wing, Itasca, Kanabec, Koochiching, Lake, Mille Lacs, Pine, and St. Louis Counties. This completes the first outcome in this activity, far surpassing our goal of 75 sites.

Many of the specimens collected in 2022 have already been pinned and are awaiting permanent labels and identification will begin this fall. The taxonomist we contracted through the University of Minnesota, Zach Portman, has continued confirming bee identifications. Dr. Portman has finished identifying most of the 2021 specimens and we are working on entering those into the DNR database.

**Seventh Update as of March 1, 2023:**

Our primary work during this reporting period has been specimen preparation, preliminary identification, and database entry. We have entered preliminary identifications to genus for all 2,100 bees collected in 2022. All of these specimens collected in 2022 are now with Dr. Zach Portman for final identification.

We are also working on entering final confirmed identifications for specimens collected in 2021. Approximately 84% of the specimens collected in 2021 are now identified to species. All specimens are identified to genus and those that are not yet identified to species represent groups of bees that are difficult to identify to species due to unresolved taxonomy.

**Final Report as of June 30, 2023 (to be submitted before August 15, 2023):**

During this project we collected around 9,300 specimens. More than 90% of the specimens collected have been identified to species and are actively incorporated into MNDNR data products. From these specimens, 255 species have been identified. By far and away, this is a large number of species to result from these surveys. Likewise, to achieve 90% identification of specimens to species is outstanding. Museum specimens that had been collected from the LMF amounted to around 4,400 specimens. The specimens collected throughout this project account for 68% of the total specimens that have ever been sampled from the LMF. Nearly all specimens collected from this project have been accessioned into the University of Minnesota Insect Collection (UMSP) with the exception of a synoptic collection of six male and six female specimens of each species housed at MNDNR, and some unique species retained by the Cariveau Native Bee Lab to assist in future identifications. We collected bees from 270 species of plants throughout this project. These data are also housed in the MNDNR database. We sampled bees from 193 sites, far surpassing in the outcome goal of 75 sites.

**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.

**ACTIVITY 2 ENRTF BUDGET: \$41,151**

Outcome	Completion Date
1. Compile data and develop summary products on wild bees	June 2023



Outcome	Completion Date
2. Coordinate 3 expert-led bee identification workshops for approx. 100 attendees	September 2022
3. Conduct at least 15 public outreach activities	June 2023

### First Update March 1, 2020

We continue to work on developing data products on wild bees. We have compiled three reports.

We have coordinated with the Xerces Society to identify audiences, potential locations, and a draft agenda for the planned workshops. We are in the process of establishing a formal contract with the Xerces Society. We have coordinated with DNR staff at Jay Cooke State Park to host the first workshop in August, coinciding with a local pollinator festival.

We have participated in four outreach activities during this reporting period. We participated at the Pollinator Party at Lyndale Park Gardens, presented at a science slam hosted by The Nature Conservancy in Minneapolis, conducted a presentation for the North Metro Master Naturalist, and hosted an episode of a MNDNR podcast (Prairie Pod).

### Second Update September 1, 2020

We published an [article](#) that acknowledged this funding source and project in the July-August issue of the Minnesota Conservation Volunteer magazine entitled *Listen to the Insects* by Jessica Petersen. The article featured insects in Minnesota and the work we need to do to understand change. We also authored an [article](#) entitled *Wild Bee Surveys: Why do we Collect Specimens?* By Nicole Gerjets published in the Scientific and Natural Areas newsletter in the spring edition. This article talked about the need to collect specimens when conducting a statewide bee survey.

We established a contract with the Xerces Society to conduct bee identification workshops. Due to covid-19 we were unable to host workshops during the summer of 2020.

### Third Update March 1, 2021

We were interviewed by the [Minnesota Daily](#) about our work and the connection with the University of Minnesota Insect Collection. We delivered a presentation on the Minnesota bee survey to the State Natural Areas Program Roundtable meeting devoted to invertebrate conservation. We continue to have conversations with The Xerces Society about hosting bee identification workshops in light of covid and exploring options to create online or virtual learning experiences.

We are collaborating with Zach Portman and Ian Lane at the UMN Bee Lab to publish the Minnesota state bee list in a peer-reviewed journal.

### Fourth Update September 1, 2021

We were interviewed by [WTIP Community Radio](#) about the native bee survey project and the surveys being conducted along the North Shore this year. We wrote three social media posts that were shared on the [SNA Facebook](#) page. These were about finding a rare bumble bee species while conducting bee surveys and to promote World Bee Day and Pollinator Week. We also developed a 'No Mow May' [post](#) for DNR social media that utilized data from the Minnesota bee surveys to determine the number of bee species that visit dandelion. We talked with The Xerces Society and decided to wait until next year to host the identification workshops due to covid-19 restrictions. We hosted a bumble bee identification field day at three sites in the Metro for 10 DNR staff members and interns that are working on bumble bee monitoring.

### Fifth Update March 1, 2022

We have had conversations with Xerces Society and begun making initial plans for the bee identification workshops. We are tentatively planning the three workshops will be hosted at state parks in northeastern Minnesota the beginning of August. We conducted four public outreach events during this reporting period

including guest lectures for two classes in the environmental studies program at the University of Minnesota, presented at University of Minnesota Department of Entomology weekly seminar series, and presented at the Minnesota Ornithological Union annual meeting in St. Paul. We continue to collaborate with Zach Portman and Ian Lane at the UMN Bee Lab to publish the Minnesota state bee list in a peer-reviewed journal.

**Update as of June 30, 2022:**

Project extended to June 30, 2023 by LCCMR 6/30/22 as a result of M.L. 2022, Chp.94, Sec. 2, Subd. 19, legislative extension criteria being met.

**Sixth Update as of September 1, 2022:**

We coordinated with Xerces Society to host 4 expert-led bee identification and monitoring workshops at the beginning of August. Each of these workshops were hosted at a different state park, Tettegouche State Park, Jay Cooke State Park, Mille Lacs Kathio State Park, and Afton State Park, to reach a wide audience. Approximately 25 people attended each workshop. We hosted a bumble bee identification field day at Whitewater Wildlife Management Area for DNR staff members and interns that are working on bumble bee monitoring or in RPBB high potential zones. This work completes the second outcome in this activity having conducted more than 3 bee identification workshops with over 100 attendees.

We participated in two public outreach events during this reporting period. We delivered a webinar to the Outdoor skills and stewardship series on March 9, 2022, produced by the MNDNR Fish and Wildlife Division outreach program about our work on wild bee surveys. We also delivered a webinar in coordination with the Sustainable Forests Education Cooperative on May 17, 2022 about our work on surveying bees in the forests. We delivered a summary of our work to the Interagency Pollinator Protection Team (IPPT) for the annual statewide pollinator report.

We continue to collaborate with Zach Portman and Ian Lane at the UMN Bee Lab to publish the Minnesota state bee list in a peer-reviewed journal.

**Seventh Update as of March 1, 2023:**

We participated in two public outreach events this reporting period. In October, we [presented](#) at [BeeCon](#), a free, public, online conference devoted to bee ecology, evolution and conservation. On February 7, Minnesota Public Radio published a [story](#) on the statewide bee survey and the exciting results of surpassing 500 species.

The [MNDNR website](#) that lists new state records documented by the Minnesota Biological Survey was updated to include 26 bees.

In January we submitted a publication listing the bee species of Minnesota to the journal Zootaxa for review from data that were collected during this project and other ENRTF funded bee projects through the MNDNR and the Cariveau Native Bee Lab. In February, this paper was accepted with minor revisions.

**Final Report as of June 30, 2023 (to be submitted before August 15, 2023):**

We participated in five public outreach events this reporting period. On March 16 we shared the results of the bee survey to a group of naturalists that is supportive of Sax-Zim Bog. On March 30 we presented the results of the bee survey to about 20 people at the annual Forestry meeting in Frontenac. In April we presented to a group of about 100 people on the results of the bee survey at the 50<sup>th</sup> Annual Prairie Chicken Society meeting on April 22. On the same day, three MBS staff attended The Great Minnsect Show and shared the results of the survey to over 900 Minnesotans. We supported Xerces Society and University of Minnesota staff at a bumble bee workshop on May 16, 2003 attended by 30. In total we participated in well over 30 outreach activities, surpassing our goal of 15.

Our co-authored publication with the Cariveau Native Bee Lab and others was published in Zootaxa.

We also developed a summary product that will be shared along with this update, to disseminate information about specialist bees in Minnesota. Throughout this project we have gained a considerable understanding of the associations between bees and their host plants. This information was compiled into a two-page, front and back, handout that briefly describes how some bees need certain plants to survive. It also shows what plant species host the most bee specialists and shows photos of some of the bees.

We completed all the outcomes in this activity.

#### **IV. 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. Any records of the federally listed Rusty patched bumble bee will be communicated with the USFWS as per the requirements of the necessary permitting, along with all other bumble bee records. Physical collections of bees will be prepared and deposited into the Insect Collection at the University of Minnesota.

The Minnesota Environment and Natural Resources Trust Fund (ENRTF) will be acknowledged through use of the trust fund logo or attribution language on project print and electronic media, publications, signage, and other communications per the [ENRTF Acknowledgement Guidelines](#).

##### **First Update March 1, 2020**

We participated in USFWS led rusty patched bumble bee working group to determine ex-situ options for the recovery of the species. As per our reporting requirements associated with our USFWS permit, we submitted our 2019 annual records of rusty patched bumble bee observations.

Curated bee specimens collected in past years continue to be accessioned into the Insect Collection at the University of Minnesota as we process them and confirm identifications. Since the inception of this project we have accessioned roughly 20,000 specimens to date.

##### **Second Update September 1, 2020**

We have thus far not made any new discoveries of rusty patched bumble bees this summer. We collaborated with the University of Minnesota and the USFWS to survey two rusty patched bumble bee nests this summer.

We have been actively collecting bee survey data using a digital app, Survey 123. Using this app will help facilitate a transition to entering specimen-level data in the fall. Specimens are continually being prepared and pinned for identification and submission into the MNDNR database.

##### **Third Update March 1, 2021**

We submitted our annual report associated with the MNDNR rusty patched bumble bee permit. Although no rusty patched bumble bees were detected during 2020 field surveys, we are required to submit all bumble bee detections.

The results of this project (and previous ENRTF bee survey appropriations) were used to author a factsheet on the status of the American bumble bee (*Bombus pensylvanicus*) in Minnesota, a species of particular interest among the public and scientists alike. DNR leadership put this factsheet to immediate use following a notice from the Center for Biological Diversity indicating their intention to file a petition to the USFWS for federal listing

under the Endangered Species Act. The Minnesota bee surveys to date have provided valuable, timely information for these types of opportunities to provide input on the status of bees in Minnesota.

The results of this project allowed us to effectively participate in a process that identified bee species in need of regional conservation. Without the efforts of this project, we would not have been able to provide information on the status of bees from a Minnesota perspective.

**Fourth Update September 1, 2021**

DNR staff have discovered two new locations of rusty patched bumble bees this summer. We reported these new locations to USFWS. We have been using Survey123 to collect all field data. These data will be transferred into the MNDNR database at the end of the field season. Specimens are being prepared for identification and submission into the MNDNR database.

**Fifth Update March 1, 2022**

We submitted our annual report associated with the MNDNR rusty patched bumble bee permit. We participated in rusty patched bumble bee recovery implementation strategy meetings. The purpose of these meetings is to achieve recovery within conservation unit 1.

All field data has been transferred into the MNDNR database and specimen identifications are now being entered.

**Update as of June 30, 2022:**

Project extended to June 30, 2023 by LCCMR 6/30/22 as a result of M.L. 2022, Chp.94, Sec. 2, Subd. 19, legislative extension criteria being met.

**Sixth Update as of September 1, 2022:**

We have been actively collecting bee survey data using the Field Maps app. These data will be transferred into the MNDNR database this fall. Specimens are continually being prepared and pinned for identification and submission into the MNDNR database.

**Seventh Update as of March 1, 2023:**

Approximately 35,000 bee observations are now included in the MNDNR Natural Heritage database. We continue to accession specimens into the University of Minnesota Insect Collection. A total of 33,400 specimens have been accessioned from surveys funded by ENRTF. All bumble bee records, including 3 detections of rusty patched bumble bee were submitted to the USFWS as part of our annual reporting for our recovery permit.

We have continued to participate in discussions with USFWS and other researchers sharing planned, ongoing, or completed work relative to the recovery of rusty patched bumble bee.

**Final Report as of June 30, 2023 (to be submitted before August 15, 2023):**

We produced a final report that covered the duration of this project and the previous two ENRTF funded bee survey projects. Over 46,000 bee records are now included in the MNDNR Natural Heritage database. Several groups of specimens have been used by the Cariveau Native Bee Lab for taxonomic revisions. Nearly all specimens have been accessioned into the University of Minnesota Insect Collection (UMSP). Along with specimens from the Cariveau Lab and others, the UMSP is now a significant regional hub for bee specimens.

**V. ADDITIONAL BUDGET INFORMATION:**

**A. Personnel and Capital Expenditures**

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

**Explanation of Use of Classified Staff:** N/A

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

Enter Total Estimated Personnel Hours for entire duration of project: 13,104	Divide total personnel hours by 2,080 hours in 1 yr = TOTAL FTE: 6.3
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**Total Number of Full-time Equivalents (FTE) Estimated to Be Funded through Contracts with this ENRTF Appropriation:**

Enter Total Estimated Contract Personnel Hours for entire duration of project: ~500	Divide total contract hours by 2,080 hours in 1 yr = TOTAL FTE: 0.24
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**VI. PROJECT PARTNERS:**

**A. Partners outside of project manager’s organization receiving ENRTF funding**

We will contract with the Xerces Society, Senior Pollinator Conservation Specialist, Sarah Foltz Jordan to deliver three citizen science bee identification and monitoring workshops (one workshop per year). Xerces Society will supply materials for all participants (up to 90 people over the 3-year project) and the Minnesota DNR will manage registration for these events.

**B. Partners outside of project manager’s organization NOT receiving ENRTF funding**

We will partner with the University of Minnesota Insect Collection Director (Dr. Ralph Holzenthal) and Curator (Dr. Robin Thomson) to accession and permanently curate insect specimens in the collection. Likewise, we will consult with Dr. Dan Cariveau of the University of Minnesota Bee Lab on sampling techniques, data sharing, and taxonomic consultation.

**VII. 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.

**VIII. REPORTING REQUIREMENTS:**

- Project status update reports will be submitted March 1 and September 1 each year of the project
- A final report and associated products will be submitted between June 30 and August 15, 2023

**IX. SEE ADDITIONAL WORK PLAN COMPONENTS:**

- A. Budget Spreadsheet**
- B. Visual Component or Map**
- C. Parcel List Spreadsheet**
- D. Acquisition, Easements, and Restoration Requirements**
- E. Research Addendum**

**Attachment A: Project Budget Spreadsheet**  
**Environment and Natural Resources Trust Fund**  
**M.L. 2020 Budget Spreadsheet**

**Legal Citation:** M.L. 2019, First Special Session, Chp. 4, Art. 2, Sec. 2, Subd. 03s

**Project Manager:** Jessica Petersen

**Project Title:** Native Bee Survey

**Organization:** MN DNR

**Project Budget:** \$600,000

**Project Length and Completion Date:** 4 years, June 30th, 2023

**Today's Date:** 6/30/2023



ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET		Revised Budget 6/30/2023	Amount Spent	Balance
<b>BUDGET ITEM</b>				
<b>Personnel (Wages and Benefits)</b>		\$497,850	\$497,843	\$7
Entomologist Research Scientist/Project Lead, \$85,000 (65%salary 35%benefits), 0.25FTE each year for 3 of 3 years				
Entomologist Natural Resource Specialist/Field Lead, \$190,000 (70% salary 30% benefits), 1.0 FTE each year for 3 of 3 years (70% salary/30% benefits)				
Bee Survey Assistants, \$158,208 (72% salary 28% benefits), 0.8 FTE each year for 3 of 3 years				
Zoology Data Manager, \$6,500 (73% salary 27% benefits), 0.025 FTE each year for 3 of 3 years				
Information Outreach Specialist \$8,000 (64% salary/36% benefits) 0.025 FTE each year for 3 of 3				
<b>Professional/Technical/Service Contracts</b>				
DNR non-competative sole-source contract with Xerces Society for up to 3 bee identification workshops that they are uniquely qualified to deliver.		\$9,900	\$9,900	\$0
Contracts with UMN per DNR-UMN Master Contract for entomological technical services.		\$24,708	\$24,707	\$1
<b>Equipment/Tools/Supplies</b>				
Field equipment and supplies to conduct bee surveys (GPS units, maps, data recorders, cameras, traps, nets, collecting containers, first-aid equipment)		\$3,050	\$3,050	\$0
Specimen preparation and storage supplies (pins, pinning boards, specimen drier, drawers, boxes, unit trays)		\$1,342	\$1,342	\$0
<b>Travel expenses in Minnesota</b>				
Travel to conduct bee surveys, ~260 field days, ~40,000 miles. Vehicles, lodging, and meals in accordance with the Commissioner's Plan.		\$20,858	\$20,858	\$0
<b>Other</b>				
Direct and necessary costs to cover HR support (~\$9,530), Safety Support (~\$1,974), Financial Support (~\$6,895), Communication Support (~\$1,251), IT Support (~\$21,583), and Planning Support (~\$1,059).		\$42,292	\$42,292	\$0
<b>COLUMN TOTAL</b>		\$600,000	\$599,992	\$8
<b>OTHER FUNDS CONTRIBUTED TO THE PROJECT</b>				
	<b>Status (secured or pending)</b>	<b>Budget</b>	<b>Spent</b>	<b>Balance</b>
<b>Non-State:</b>	N/A		\$ -	\$ -
<b>State:</b>				
General Fund for program zoologist project supervision, oversight, guidance.	Secured	\$ 40,000	\$ 40,000	\$ -
<b>In kind:</b>	N/A		\$ -	\$ -
<b>PAST AND CURRENT ENRTF APPROPRIATIONS</b>				
	<b>Amount legally obligated but not yet spent</b>	<b>Budget</b>	<b>Spent</b>	<b>Balance</b>
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	\$ 600,000	\$ -