Environment and Natural Resources Trust Fund

M.L. 2023 Approved Work Plan

General Information

ID Number: 2023-154

Staff Lead: Corrie Layfield

Date this document submitted to LCCMR: May 19, 2023

Project Title: Developing Conservation Priorities for Rare and Specialist Bees

Project Budget: $619,000

Project Manager Information

Name: Daniel Cariveau

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Project Reporting

Date Work Plan Approved by LCCMR: June 22, 2023

Reporting Schedule: April 1 / October 1 of each year.

Project Completion: June 30, 2026

Final Report Due Date: August 14, 2026

Legal Information

Legal Citation: M.L. 2023, Chp. 60, Art. 2, Sec. 2, Subd. 03j

Appropriation Language: $619,000 the first year is from the trust fund to the Board of Regents of the University of Minnesota to collect data on rare and specialist bees and their habitat preferences, determine their conservation status, and develop strategies to improve their chances of survival.

Appropriation End Date: June 30, 2026

Narrative

Project Summary: We will collect data on occupancy and range of rare pollen specialized bees and their habitat preference to determine status and conservation strategies

Describe the opportunity or problem your proposal seeks to address. Include any relevant background information.

Despite concentrated efforts to characterize bees across the United States, the lack of historic data has made evaluating and prioritizing bee species for conservation elusive. The Minnesota DNR has conducted extensive bee surveys across the state and, together with the UMN bee lab, created a comprehensive dataset with over 118,000 observations, representing 492 species. As a result, we have identified rare species potentially in decline and in need of conservation prioritization. However, due to the idiosyncratic nature of bee species, it is unclear whether the rarity of some of these species is related to decline or if they have life histories that make them exceptionally difficult to find, and thus, new sampling strategies are needed.

Two aspects of bee biology make certain bee species difficult to detect: floral specialization and nesting habitat. Bees with specific pollen requirements (floral specialist) are difficult to detect if the specific flowers they use are not surveyed in a systematic way. Bees with specific soil nesting requirements will not be detected if those habitats are not targeted for sampling. Bees with these specializations are likely at elevated risk from habitat fragmentation as the flowers and soils they need become increasingly isolated across the landscape.

What is your proposed solution to the problem or opportunity discussed above? Introduce us to the work you are seeking funding to do. You will be asked to expand on this proposed solution in Activities & Milestones.

We will determine the conservation status of at least 12 specialist bees that are predicted to be in decline or at risk of extinction. First, we will leverage existing data from the DNR and UMN bee lab to focus on rare bees that are pollen specialists across MN. We will use DNR MBS data to identify populations of flowers and perform intensive targeted sampling across the region to determine the presence of the bee species of focus. We will do this for four bee genera, providing high quality and reliable data as to the status of these bees.

Second, we will investigate how sandy habitats, specifically dune-like natural areas, interact with pollen specialization to make bee species exceptionally rare and at risk. We will target two species of prairie forbs, purple prairie clover (Dalea purpurea) and silky prairie clover (Dalea villosa), which host at least 7 rare and specialized bee species. We will target areas where these rare bees are known to occur, such as Weaver Dunes, and then sample nearby non-dune areas where prairie clover exists. This sampling will allow us to understand how important sandy habitats are to a subset of rare, pollen-specialized, bees.

What are the specific project outcomes as they relate to the public purpose of protection, conservation, preservation, and enhancement of the state's natural resources?

We will generate new range and rarity information for a subset of potentially imperiled pollen-specialist bees identified in the Bees of Minnesota collaboration between the MN DNR and UMN bee lab. These data will be used in making assessments of conservation status and for potential listing as Species of Greatest Conservation Need (SGCN). Additionally, our work will identify the plants and soil conditions needed to support species of interest. We will disseminate this information through outreach and report documents so that restoration practitioners and conservation planners can prioritize the establishment of host plants needed in the areas of greatest impact.

Project Location

What is the best scale for describing where your work will take place?

Statewide

What is the best scale to describe the area impacted by your work?

Statewide

When will the work impact occur?

During the Project and In the Future

Activities and Milestones

Activity 1: Determining Range and Conservation Status of Pollen Specialist Bees

Activity Budget: $235,309

Activity Description:
Using data from MBS and UMN bee lab we will target surveys for potentially declining bee species. We will focus on species that are floral pollen specialists as they are more likely to be in decline and their potential habitat is easy to identify. These bees include oil-collecting bees, cellophane bees, mining bees, and short-faced bees). Collectively, these genera contain specialists that use pollen from plants such as willow, native loosestrifes, bellflowers, prairie alumroot, leadplant, goldenrod, and spring beauties.

To determine the conservation status of pollen specialist bees, we will consult with DNR MBS botanists to select host plant populations. We will survey host plant populations across their range to infer the degree to which a pollen specialist bee's range overlaps with that of the host plant. We will estimate local population sizes from a subset of the identified bee populations. Together this information will allow us to understand the range and abundance of a given pollen specialist bee species. In particular, we will collaborate with the DNR to use these data to inform the NatureServe S-Rank calculator. We will collect from approximately 20 sites per year with 1-3 visits per site for a total of approximately 50 visits.

Activity Milestones:

Description	Approximate Completion Date
Visit potential sample sites, confer with MBS staff, and finalize sampling locations	December 31, 2023
Initial field data collection investigating species ranges	October 31, 2024
Follow up field collection targeting species for abundance estimation	October 31, 2025
Summarize results for stakeholders and information disseminated	June 30, 2026

Activity 2: Determining soil conditions needed for the conservation of rare pollen specialist bees

Activity Budget: $381,191

Activity Description:
To understand how sandy habitats play a role in bee species biology, we will focus on the bee visitors to purple prairie clover and silky prairie clover in a variety of habitat types. Prairie clover is a cosmopolitan genus, living in both mesic and xeric sites. This habitat range, combined with the rare bees that specialize on its pollen, make prairie clover an excellent focal species to understand how habitat may limit the populations of bee species.

We will select sites in summer 2023 that vary in the amount of soil sandiness and have a high-quality flowering community. We will use current data to identify sites where prairie clover's specialist bees were observed. In addition, we will use the Soil Survey Geographic data set (SSUURGO) to map soil characteristics at sites and choose sites that vary in soil sandiness. We will use a paired design and sample xeric and mesic sites in close proximity. We will compare differences in species present between paired sites to determine if sandy habitats harbor unique species. This will expand our knowledge of species that specialize on prairie clover, specifically cellophane bees, the white-clothed longhorn bee, and the pale-yellow fairy bee.

Activity Milestones:

Description	Approximate Completion Date

Visit potential sample sites, confer with MBS staff, and finalize sampling locations	December 31, 2023
Initial intensive field data collection	October 31, 2024
Second year data collection honing in on specific species or habitats	October 31, 2025
Summarize results for stakeholders and information disseminated	June 30, 2026

Activity 3: Disseminating Information to Conservation Stakeholders

Activity Budget: $2,500

Activity Description:

As a result of this work, we will generate important new data about an important group of bee pollinators and their conservation status. To disseminate this knowledge to interested stake holders, we will create outreach materials and hold workshops to inform Minnesotans of the results of this project. We will specifically target restoration practitioners, summarizing the soil conditions that would be especially impactful for restoration planning and the flower species that would be of high impact to the species we investigated. We will build off existing ENTRF funded resources such as the Pollinator Resource Guide information currently in development by the MNDNR to supplement those tools with information about bee specialists. We will make our data publicly available through the MN DNR. Finally, we will collaborate with UMN Extension to disseminate this information through events and digital platforms.

Activity Milestones:

Description	Approximate Completion Date
Create outreach materials - online and in print	June 30, 2026
Hold collaborative workshop to disseminate results to land managers	June 30, 2026
Collaborate with UMN Extension on potential workshops and disseminating media	June 30, 2026

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Dr. Jessica Petersen	Minnesota Biological Survey	Contract manager responsible for project design, oversight, coordination with UMN Bee lab, and data analysis.	Yes
Nicole Gerjets	Minnesota Biological Survey	Responsible for actively managing the project, planning, conducting fieldwork, and managing specimen preparation and identification.	Yes
Dustin Graham	Minnesota Biological Survey	Dustin is a plant ecologist and will assist in identifying populations of host plants.	No
Christina Locke	Minnesota Department of Natural Resources	Christina is the pollinator coordinator for the DNR and will assist with disseminating information of project outcomes.	No
Dr. Elaine Evans	University of Minnesota Extension	Elaine is the native bee extension specialist and we will collaborate on best ways to disseminate results through the extension network.	No

Dissemination

Describe your plans for dissemination, presentation, documentation, or sharing of data, results, samples, physical collections, and other products and how they will follow ENRTF Acknowledgement Requirements and Guidelines.
Research findings will be used in three primary ways. First, they will be used for the purposes of evaluating the conservation status of the species investigated for the purpose of being added to the SGCN list. Second, results from activity two will be synthesized into peer reviewed manuscripts. Lastly, we will generate outreach documents and guidance for land managers where we believe including floral host plants in habitat reconstruction projects may benefit rare species. Additionally, all data from this work will be available publicly, barring any additions to the state threatened and endangered list that would render those data non-public to protect the locations of rare species.

For all publications, including peer-reviewed publications, we will acknowledge the Environment and Natural Resources Trust Fund and reference the specific grant number. For talks and outreach material, we will acknowledge the Environment and Natural Resources Trust Fund by including the logo. We will also acknowledge verbally or in writing on talks and outreach material.

Long-Term Implementation and Funding

Describe how the results will be implemented and how any ongoing effort will be funded. If not already addressed as part of the project, how will findings, results, and products developed be implemented after project completion? If additional work is needed, how will this work be funded?
Results will be disseminated through digital and physical outreach materials developed as a part of activity three, through professional conference presentations, peer reviewed papers, and stake holder meetings. We will work with partners to host informational workshops for restoration practitioners to help disseminate information on plant species and habitats to target. The UMN bee lab has a strong history of collaboration with the DNR, Fish and Wildlife Service, and the Board of Water and Soil Resources in organizing and presenting informational workshops related to habitat restoration and pollinators in greater Minnesota which will allow us to disseminate results.

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	$ Amount
Personnel								
Postdoctoral Scholar		A postdoctoral research scholar will be hired as co-PI and manage the implementation of the grant over its three year span			20.9%	2.81		$181,748
Bee Biologist/taxonomist		Dr. Zach Portman will be providing critical support for study design, bee identification, and manuscript writing.			28.7%	1.26		$83,143
Research Technicians		Research technicians assist with field activities that begin before the end of classes and extend into fall after classes have begun			7.5%	0.36		$36,877
Undergraduate Research Technicians		We will hire and mentor two undergraduate researchers for sampling support in summer and data and specimen processing during the semester			0%	0.66		$40,261
							Sub Total	**$342,029**
Contracts and Services								
Minnesota Department of Natural Resources	Sub award	Conduct targeted surveys of bee species recognized as potentially in decline as outlined in Activity 1. Budget includes funds for two unclassified DNR staff members ($210,109), one at 0.2 FTE and the other at 0.75 FTE for each year, and travel to field sites ($25,200).				2.61		$235,310
							Sub Total	**$235,310**
Equipment, Tools, and Supplies								
	Tools and Supplies	Pins	Needed for the curation of collected specimens					$350
	Tools and Supplies	Specimens Drawers	Needed for long term storage and curation at the UMN insect collection					$560
	Tools and Supplies	Unit Trays	Unit trays go in specimen drawers and hold the physical specimens. These are needed for long term					$96

			storage and curation of specimens at the UMN insect collection					
	Equipment	collecting materials (nets, vials, tractor flags)	These are used for the field collection and preservation of insect specimens					$600
							Sub Total	**$1,606**
Capital Expenditures								
							Sub Total	**-**
Acquisitions and Stewardship								
							Sub Total	**-**
Travel In Minnesota								
	Miles/ Meals/ Lodging	Budgeting for 50,000 miles over three year at $0.60 a mile	Car Rental for travel to field sites					$30,000
	Miles/ Meals/ Lodging	We will use a combination of camping and hotel stays during extended field collecting events. We estimate an average $85 dollars/night with 43 nights over 3 years.	Lodging					$3,655
	Miles/ Meals/ Lodging	Per diem for researchers on overnight stays. We estimate $50 per person for a combined 78 stays over three years.	Per Diem					$3,900
							Sub Total	**$37,555**
Travel Outside Minnesota								
							Sub Total	**-**
Printing and Publication								
	Publication	Planning for the publication of two to three papers based on research	Publishing Peer Reviewed Papers					$2,000
	Printing	High quality printing of handouts/reports, planning for at least 100 copies.	Handouts/Reports					$500
							Sub Total	**$2,500**
Other Expenses								

							Sub Total	**-**
							Grand Total	**$619,000**

Classified Staff or Generally Ineligible Expenses

Category/Name	Subcategory or Type	Description	Justification Ineligible Expense or Classified Staff Request

Non ENRTF Funds

Category	Specific Source	Use	Status	$ Amount
State				
			State Sub Total	**-**
Non-State				
			Non State Sub Total	**-**
			Funds Total	**-**

Attachments

Required Attachments

Visual Component

File: 089ca638-a69.pdf

Alternate Text for Visual Component

The graphic visually depicts activities one and two of our proposal. One image is a range map of the spring beauty miner bee in MN of the range of the flower. The second depicts a bee that may be specialized to live in dune habitats but we are uncertain....

Optional Attachments

Support Letter, Photos, Media, Other

Title	File
Approval from UMN Sponsored Projects Administration	6827ce9f-df0.pdf
Background Check	4d47ccbb-ca4.pdf
Research Addendum	0efa4945-7c9.pdf

Difference between Proposal and Work Plan

Describe changes from Proposal to Work Plan Stage

We cut some for personnel to meet new budgets

Additional Acknowledgements and Conditions:

The following are acknowledgements and conditions beyond those already included in the above workplan:

Do you understand and acknowledge the ENRTF repayment requirements if the use of capital equipment changes?

N/A

Do you agree travel expenses must follow the "Commissioner's Plan" promulgated by the Commissioner of Management of Budget or, for University of Minnesota projects, the University of Minnesota plan?

Yes, I agree to the UMN Policy.

Does your project have potential for royalties, copyrights, patents, or sale of products and assets?

No

Do you understand and acknowledge IP and revenue-return and sharing requirements in 116P.10?

N/A

Do you wish to request reinvestment of any revenues into your project instead of returning revenue to the ENRTF?

N/A

Does your project include original, hypothesis-driven research?

Yes

Does the organization have a fiscal agent for this project?

Yes, Sponsored Projects Administration