

Environment and Natural Resources Trust Fund 2015 Request for Proposals (RFP)

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

Minnesota Native Bee Atlas: A Citizen Science Project

Category: A. Foundational Natural Resource Data and Information**Total Project Budget:** \$ 790,000**Proposed Project Time Period for the Funding Requested:** 4 years, July 2015 - June 2019**Summary:**

Engages citizens in documenting distribution and phenology of wild Minnesota bees. Complements other pollinator surveys by sampling extensively throughout Minnesota; focusing on specific bees that citizen scientists can sample accurately.

Name: Robert Blair**Sponsoring Organization:** U of MN**Address:** 2003 Upper Buford Cir, Ste 135
St. Paul MN 55108**Telephone Number:** (651) 644-1591**Email** blairrb@umn.edu**Web Address** minnesotamasternaturalist.org**Location****Region:** Statewide**County Name:** Statewide**City / Township:****Alternate Text for Visual:**

Process of developing three bee survey protocols for citizen scientists, collecting and validating data, and creating an atlas of native bee distribution and phenology in the state.

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



I. PROJECT STATEMENT

Need. Wild bees are a vital part of our state's ecosystems. However, we know very little about their distribution, abundance, and seasonal activity. The Minnesota Wild Bee Atlas will document the distributions throughout the state of tunnel-nesting bees, which comprise ~30% of Minnesota's bee species. Their nesting habits allow the use of standardized nesting blocks, which trained citizen scientists can easily deploy. The project also focuses on bumble bees because of the straightforward visual identification of most Minnesota bumble bees and their high public interest.

This project complements and builds upon two LCCMR-funded projects that are documenting bee distributions in Minnesota. "Wild Bee Pollinator Surveys in Prairie-Grassland Habitats", managed by Gerda Nordquist MN-DNR, will intensively sample wild bees in **up to 90 random sites** in the prairie portions of the state. "Enhancing Pollinator Landscapes", managed by Marla Spivak UMN, will intensively survey **three areas** in southeastern Minnesota to compare historic records to current ones. The "Minnesota Wild Bee Atlas" will add the extensive sampling power of citizen science to these survey efforts enabling much broader geographic coverage. It will involve **hundreds of volunteer citizen scientists** systematically documenting wild bee **distributions and phenology** at **hundreds of sites throughout the state**. It will also make the **data of all three projects** easily accessible to researchers and the public through its digital portal.

Goals and Outcomes. The goal of Minnesota Wild Bee Atlas is to promote the conservation of Minnesota native pollinators. The direct outcomes of the project are to:

- 1) determine the distribution of tunnel-nesting and bumble bees *throughout* Minnesota;
- 2) document the *phenology* of these bees to aid in their management and conservation;
- 3) promote an understanding of native bees among Minnesota citizens by engaging them in documenting bee distribution and phenology; and
- 4) combine this information with that from other LCCMR-funded pollinator surveys in a *digital atlas* to make this information widely available to researchers and the public.

Process. The project will occur in three steps:

- 1) Refine existing sampling protocols for use in Minnesota, create a website and database to enter and retrieve data, and develop training materials and workshops for the citizen scientists who will collect the data.
- 2) Train citizen scientists to survey bees across the state using three tiers of sampling and rigor: casual observation of all bees, targeted observation of bumble bees, and systematic sampling of tunnel-nesting bees.
- 3) Cross-validate data from citizen scientists, combine with data from the other Minnesota bee surveys, and make all available in a database that can be queried by citizen scientists, researchers, and the general public.

II. PROJECT ACTIVITIES AND OUTCOMES

Activity 1: Develop citizen science sampling protocols, training, and digital database. **Budget: \$95,000**

Sampling protocols for tunnel-nesting bees will be based on citizen-science projects in Florida (UFL's Native Buzz) and Colorado (UC's The Bees' Needs). The sampling protocol for bumble bees will be based on the Twin Cities-based Bumble Bee Survey. The reporting of incidental observation of all bee species will follow the protocols of the National Biological Information Infrastructure's (NBII) DiscoverLife and UMN's Monarch Larva Monitoring Project. The Atlas' website and database will be adapted from the Monarch Larva Monitoring Project. The website will allow citizen scientists to adopt areas (blocks) across Minnesota in which they will survey the tunnel-nesting and bumble bees and then enter their site-specific data. It will also allow citizen scientists to report and upload photographs of observations of all bee species for verification.

Outcome	Completion Date
1. Develop tunnel-nesting, bumble, & observed bee survey protocols & training materials.	1/1/16
2. Develop website to support recruitment, training, data submission, and quality review	1/1/16



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Activity 2: Train citizen scientists and conduct survey of native bee fauna.

Budget: \$508,000

Citizen scientists will be recruited and trained through both online and in-person methods. We expect that many volunteers will be Minnesota Master Naturalists, Master Gardeners, participants in the LCCMR-funded Breeding Bird Atlas, and regular DNR volunteers. We will also broaden participation to youth groups and their leaders.

Outcome	Completion Date
1. Recruit and train ~750 citizen scientists for all three tiers of bee survey protocols.	6/1/17
2. Deploy ~250 citizen scientists with appropriate materials to conduct surveys of tunneling bees at sites across the state that they have adopted for 3 annual cycles. ~ 250 will similarly survey bumble bees at adopted sites. ~250 will conduct incidental observations of all bees.	10/31/18
3. Monitor incoming data, identify sources of reporting error, refine training and website.	10/31/18

Activity 3: Validate data, combine with other surveys, and create digital atlas.

Budget: \$186,000

To ensure validity and usefulness of the data, the staff entomologist will collect subsamples of nesting blocks and raise larvae for identification. We will combine all data from this project with that generated by the LCCMR-sponsored *Wild Bee Pollinator Surveys in Prairie-Grassland Habitat* and *Enhancing Pollinator Landscapes* so that citizen scientists, researchers, and the general public can explore the distributions of Minnesota's bees.

Outcome	Completion Date
1. Collect samples of 250 bee-nesting blocks per year for three years (subsamples each year from the 3 blocks allotted to each citizen scientist), hatch larvae, identify bees.	10/30/18
2. Apply quality control measures to subsamples to cross-validate data.	4/31/19
3. Supplement website to make all known bee data from multiple surveys available through online query to researchers and public.	6/31/19

III. PROJECT STRATEGY

A. Project Team/Partners

Robert B. Blair, Prof. in Fisheries, Wildlife and Conservation Biology UMN and Project Director of Minnesota Master Naturalist, will direct the project and be responsible for submitting project reports. He and **Karen Oberhauser**, Prof. in Fisheries, Wildlife and Conservation Biology UMN and Director of Monarch Larva Monitoring Project, will develop the survey and training protocols in consultation with **Marla Spivak**, Prof. of Entomology UMN, and her "**Bee Lab.**" **Kevin Williams**, Curator of Outreach at the Bell Museum of Natural History, will develop the cadre of citizen scientists and train them on the survey protocols. **Joel Gardner**, M.S. Entomology, will validate and identify bee subsamples. **Elaine Evans**, Entomology Ph.D. Student and Minnesota Bumble Bee Survey creator, will guide the bumble bee data collection. **Megan Benage**, MNDNR Ecological and Water Resources, will assist with protocol development, training, and coordination of tasks with DNR.

B. Project Impact and Long-Term Strategy

The project will 1) provide the first **systematic statewide assessment** of the distribution of tunnel-nesting and bumble bees; 2) provide **phenologies for individual bee species**, which can guide management practices such as timing of herbicide use, prescribed burns, mowing, and other management actions; 3) develop a **statewide cohort of citizen scientists** that is knowledgeable about native bees; and 4) link with the Global Biodiversity Information Facility (www.gbif.org), an international clearinghouse on biodiversity data. The long-term strategy for the project is to provide data that will aid in the conservation of Minnesota's wild bees.

C. Timeline Requirements

The Minnesota Native Bee Atlas will take four years to complete and could be scaled to two rounds of two-year funding from the LCCMR. Bee populations are cyclical. Robust sampling requires a minimum of three years at a site. In total, we will need one year of funding to develop the surveys and train the citizen scientists, three summers of sampling, and a final winter and spring to validate and prepare the findings for dissemination.

2015 Detailed Project Budget

Project Title: Minnesota Wild Bee Atlas: A Citizen Science Project

IV. TOTAL ENRTF REQUEST BUDGET (4-year project)

BUDGET ITEM	AMOUNT
Personnel:	
Robert Blair, Project Director (75% salary, 25% benefits); 8.3% FTE for 4 years	\$51,782
Karen Oberhauser, Training and Database Construction (75% salary, 25% benefits); 8.3% FTE for 4 years	\$55,902
Kevin Williams, Volunteer Training (75% salary, 25% benefits); 12.5% FTE for 4 years	\$44,477
Elaine Evans, Bumble Bee Survey Coordinator (81% salary, 29% benefits); 16.6% FTE for 4 years	\$15,637
Joel Gardner, Entomologist and Database Manager (83% salary, 17% benefits); 100% FTE for 4 years	\$167,743
Project Coordinator (75% salary, 25% benefits); 100% FTE for 4 years	\$252,084
Contracts:	
Witty Design to build website and database in Year 1 (\$25,000), to refine in Years 2&3 (\$10,000/yr), to expand Year 4 (\$20,000) (Witty Design is the desired contractor as they will adapt the existing Monarch Larvae Monitoring Project web site which they developed and manage.)	\$65,000
Graphic design of educational materials (instruction handbooks, web site, recruiting/informational brochures). (To be determined by competitive bid.)	\$26,000
Equipment/Tools/Supplies:	
1500 Bee nesting blocks -- 3 per each of 250 initial volunteers, 500 for replacements, plus 250 for broader distribution.	\$22,500
Educational materials (1000 handbooks, 3000 brochures, signage)	\$17,500
Postage to ship nesting blocks (Necessary for initial distribution and for validation, \$12.35 per box of 2)	\$14,000
Boxes for Shipping	\$1,375
Cloud storage for database	\$12,000
Acquisition (Fee Title or Permanent Easements):	\$ -
Travel:	
Travel for 3 staff members to offer 25 one-day training sessions in Twin Cities, Morris, Crookston, Lamberton, Duluth, Rochester, and Bemidji. Each takes 3 days and 2 nights of staff time.	\$18,000
Travel for entomologist to cross validate traps.	\$10,000
Additional Budget Items:	
Workshop Materials (\$20 per volunteer trained in 30 workshops with expected attendance of 30 per workshop)	\$15,000
TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND \$ REQUEST =	\$789,000

V. OTHER FUNDS

SOURCE OF FUNDS	AMOUNT	Status
Other Non-State \$ To Be Applied To Project During Project Period:		
Other State \$ To Be Applied To Project During Project Period:	\$ -	
In-kind Services To Be Applied To Project During Project Period:		
Rob Blair will work an additional 4% FTE for 4 years as part of his academic duties.	\$17,748	<i>Secured</i>
Karen Oberhauser will work an additional 1% FTE for 4 years as part of her academic duties.	\$4,790	
Kevin Williams will work an additional 12.5% FTE for 4 years as part of his outreach efforts at the Bell.	\$30,812	
Megan Benage will work 60 hours per year for 4 years as part of her duties with MNDR.	\$8,148	
Each of the 750 citizen scientists involved in the project will provide approximately 40 hours of work currently valued at \$10/hr (The current federal valuation for Minnesota volunteer work is \$21/hr (IndependentSector.org)).	\$300,000	
Funding History:	\$ -	
Remaining \$ From Current ENRTF Appropriation:	\$ -	

Creating the Minnesota Native Bee Atlas

Step 1 Train Citizen Scientists in Three Bee Survey Protocols

All Bees

Bumble Bees

Tunnel-Nesting Bees



Step 2 Implement Three Protocols for Three Years



Casual Observation
of All Bees



Structured Observation
of Bumblebees



Stratified Sampling using
Bee Blocks

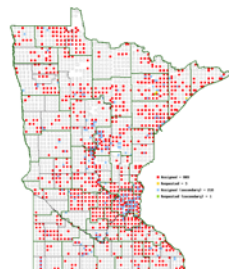
Step 3 Build Digital Atlas with Data from Multiple Sources

All Bees

Bumble Bees

Tunnel-Nesting Bees

LCCMR: Wild Bee
Pollinator Surveys
in Prairie-
Grassland
Habitats



Site intensive historical
records such as Itasca
Field Station published in
Gardener 2013

LCCMR: Enhancing
Pollinator
Landscapes



04/21/2014

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Project Manager Qualifications:

Dr. Rob Blair is a Professor of Fisheries, Wildlife, and Conservation Biology in the College of Food, Agriculture and Natural Resource Science at the University of Minnesota. He initiated the Minnesota Master Naturalist program in 2005 with a grant from the National Science Foundation's Informal Science Education Program. Currently, he coordinates efforts of four Extension educators working on the project and two administrative assistants. His role with the Minnesota Bee Survey will be similar. He will hire and oversee a full-time coordinator to handle the day-to-day functioning of the program and direct contact with the volunteer citizen scientists. He will oversee all survey protocol development, budgets, training, and evaluation. Coordination with partners will be the responsibility of both Blair and the staff member. We expect that many of the citizen scientists participating in this project will be Minnesota Master Naturalists but we will also expand this pool by recruiting from other citizen-science projects including the LCCMR-funded Minnesota Breeding Bird Atlas and the Twin Cities based Bumble Bee Survey.

Dr. Karen Oberhauser will be assisting with the project. She is a Professor of Fisheries, Wildlife, and Conservation Biology in the College of Food, Agriculture and Natural Resource Science at the University of Minnesota. She is the director of the Monarch Larva Monitoring Project (www.mlmp.org), a National Science Foundation funded and internationally recognized citizen science project. In 2013, she was honored at the White House as a "Champion of Change for Citizen Science" for this effort. She will advise on survey protocol development and work with the web developer to create the database infrastructure that will be at the core of this project.

Megan Benage is a Regional Ecologist in MNDNR Ecological and Water Resources Division. She will provide support from the DNR in assisting with project planning, offering technical support in the form of identifying habitats that support native bees; and developing guidelines for box placement sites and bumblebee survey sites.

Kevin Williams, Curator of Outreach at the Bell Museum of Natural History has extensive experience in pollinator education and outreach. He will be in charge of developing and implementing the training program for the citizen science volunteers.

Elaine Evans is a doctoral student in Entomology at the University of Minnesota. She is the author of the book "Befriending Bumble Bees" & initiated the MN Bumble Bee Survey (befriendingbumblebees.com), which has been implemented in the Twin Cities. She will guide the bumble bee portions of the project.

Joel Gardener M.S. is a member of Marla Spivak's Bee Lab at UMN. He will be housed in the Bee Lab and serve as the project entomologist and data manager.

Organization Description:

This project is a collaboration of entities with strengths in bee sampling and surveys (**UMN Bee Lab, MNDNR**); citizen science (**Monarch Larva Monitoring Project**); volunteer recruitment and training (**Minnesota Master Naturalist**); outreach (**UMN Extension, Bell Museum**), and natural history data management (**Bell Museum, MNDNR**).

This project will be managed by University of Minnesota Extension and formally housed in the Bell Museum of Natural History. Volunteers will be recruited heavily from the Minnesota Master Naturalist Program as well as other insect-oriented citizen groups. Technical support will be from Dr. Marla Spivak's Bee Lab. We will coordinate efforts and share data with the DNR and the LCCMR-funded *Wild Bee Pollinator Surveys in Prairie-Grassland Habitats* managed by Gerda Nordquist and the survey portions of the resampling efforts of the LCCMR-funded *Enhancing Pollinator Landscapes* managed by Dr. Marla Spivak.