Environment and Natural Resources Trust Fund
M.L. 2024 Approved Work Plan

General Information

ID Number: 2024-206

Staff Lead: Lisa Bigaouette

Date this document submitted to LCCMR: June 7, 2024

Project Title: Preserving Minnesota Wildflower Information

Project Budget: $199,000

Project Manager Information

Name: Ya Yang

Organization: U of MN - Bell Museum of Natural History

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Project Reporting

Date Work Plan Approved by LCCMR: June 20, 2024

Reporting Schedule: June 1 / December 1 of each year.

Project Completion: August 31, 2026

Final Report Due Date: October 15, 2026

Legal Information

Legal Citation: M.L. 2024, Chp. 83, Sec. 2, Subd. 03t

Appropriation Language: $199,000 the second year is from the trust fund to the Board of Regents of the University of Minnesota, Bell Museum of Natural History, to preserve and enhance Minnesota Wildflowers Information, an online tool for plant identification, by integrating the content and functionality of the website with the Minnesota Biodiversity Atlas for public use as required by Laws 2017, chapter 96, section 2, subdivision 3, paragraph (e).

Appropriation End Date: June 30, 2027

Narrative

Project Summary: We propose to integrate Minnesota Wildflowers Information, an online tool for plant identification, with the Minnesota Biodiversity Atlas, to preserve and extend this popular ENTRF-supported resource for future use.

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

Minnesota Wildflowers Information (https://www.minnesotawildflowers.info/) is a popular web application developed by a group of dedicated citizen scientists to serve demand for accessible and accurate information about Minnesota plant life. Since its inception in 2007, the website has grown to cover more than 1,700 plant species, serving over 16,000 digital images, and receiving over 1 million page visits per year. The tremendous popularity of the Minnesota Wildflowers website threatens to overwhelm the volunteer effort of this small group of dedicated plant enthusiasts who are currently funded by online donations. The organizational board recognizes that this situation is not sustainable and, without a long-term solution, the project legacy is at risk.

Two prior ENTRF awards, $150,000 in 2014 and $270,000 in 2017, stipulated that access to public data collected with ENTRF support would be maintained by the Bell Museum in the event that the non-profit organization, Minnesota Wildflowers Information, should no longer be in a position to do so. The Bell Museum has preserved biodiversity data since an 1872 Act of the State Legislature charged the University of Minnesota with the responsibility of operating a state museum of natural history.

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 propose to preserve Minnesota Wildflowers Information by integrating the content and functionality of the website with the Minnesota Biodiversity Atlas, an online clearinghouse for state-wide natural history information hosted by the Bell Museum. The Atlas was launched with ENTRF support in 2015 to provide public access to the museum collections. With support in 2018 and a pending LCCMR recommendation, the expanded Atlas aims to serve information from 12 other museums, colleges, and state agencies, making publicly available more than 2.5 million records of what lives in Minnesota's environment. Combining Minnesota Wildflowers and the Biodiversity Atlas will leverage the strengths of each project in serving Minnesota's natural resource data and information.

The greater popularity of Minnesota Wildflowers (>1,000,000 visits/year) compared to the Biodiversity Atlas (175,000 visits/year) reflects the former's non-technical, user-friendly interface. We propose to retain the appearance and functionality of Minnesota Wildflowers while combining it with the greater volume of information in the Atlas (e.g., 170,000 plant specimen photos compared to 16,000 field photos). By ingesting data from Minnesota Wildflowers, the Bell Museum will also fulfill its statutory obligation to maintain long-term public access to this ENTRF-supported information.

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?

User-friendly online tools for identifying Minnesota plants support the preservation of natural resources by providing accurate information to diverse stakeholders. Anyone faced with the challenge of naming an unknown plant outdoors can benefit from access to simple descriptions, field photos, distribution maps, museum specimens, and expert records. Examples of users include landowners, wildlife managers, foresters, policy makers, natural resource professionals, developers, environmental consultants, teachers, students, citizen scientists, outdoor enthusiasts, gardeners, and anyone curious about Minnesota flora. The opportunity for users to share moderated comments and questions will also allow for gathering new information about Minnesota's botanical resources over time.

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: Ingest the Minnesota Wildflowers Information dataset and field photos into the Minnesota Biodiversity Atlas database under the Symbiota software platform

Activity Budget: $72,000

Activity Description:

Descriptions of more than 1,700 Minnesota plant species, associated data, and more than 16,000 field photographs from Minnesota Wildflowers Information will be uploaded to the Minnesota Biodiversity Atlas by a Bell Museum curatorial assistant. This work first involves comparing the database schema for Minnesota Wildflowers and the Atlas to align information residing in different tables so that compatible data are uploaded accurately. Each species in the Atlas has a webpage where Minnesota Wildflowers Information will be displayed.

Information to be incorporated in the Atlas includes scientific names, common names, families, habitat descriptions, flowering and fruiting seasons, pollinators, field notes and attributes for species identification. Non-technical descriptions of attributes like plant height, leaf shape, leaf arrangement, flower shape, flower color, and fruit type will be uploaded to corresponding fields in the database schema that underpins the Atlas. Annotated field photographs illustrating diagnostic features for each species are also to be included. Missing information and new photos will be collected during two field seasons. Together with the museum specimen and expert observation records that already exist in the Atlas, the combined data will be made accessible through a new web interface to be developed in Activities 2 & 3.

Activity Milestones:

Description	Approximate Completion Date
Minnesota Wildflowers data tables mapped to Minnesota Biodiversity Atlas data tables	December 31, 2024
Minnesota Wildflowers data and field photos incorporated with the Biodiversity Atlas	June 30, 2025

Activity 2: Improve the Minnesota Biodiversity Atlas interface to reflect the popular, user-friendly appearance and functionality of the Minnesota Wildflowers Information website

Activity Budget: $89,000

Activity Description:

This activity involves development of the open-source software, Symbiota, to support the appearance and functions of Minnesota Wildflowers Information in the framework of the Biodiversity Atlas. Our developer at the Minnesota Supercomputing Institute, external consultants, and the original developer of Minnesota Wildflowers will adapt the available code so that users can identify plants in the manner to which they are accustomed. A model for this exists at OregonFlora (https://oregonflora.org/), a collaboration between Oregon State University and plant enthusiasts similar to what we proposed. We will consult with the developers of OregonFlora to borrow open-source code and develop new code as needed.

The main new function to be developed is the capacity for users to identify plants by searching and filtering the simple plant attributes described under Activity 1. The online identification tool, an "interactive key", is an especially popular feature of Minnesota Wildflowers. High-resolution species distribution maps based on Bell Museum specimens and expert observations will also be integrated. We propose to compensate plant enthusiasts, naturalists, and other users in the beta-testing and refinement of the interface prior to public release. This software development has potential for future application with birds, mammals, fish, etc.

Activity Milestones:

Description	Approximate Completion Date
Database users, managers and developers consulted	December 31, 2024
Database software developed and beta-tested internally	December 31, 2025
Final product presented to Minnesota Wildflowers Information	August 31, 2026

Activity 3: Develop database software to support interactivity with users submitting comments and questions to be moderated by museum staff and volunteers

Activity Budget: $38,000

Activity Description:

One of the most popular features of Minnesota Wildflowers is how users can comment, share observations, describe where to see plants, and ask questions. This gets users engaged and provides a strong sense of community, which has resulted in more than one million site visits per year on average. However, a moderated forum is not yet part of the Symbiota platform or OregonFlora. Implementing a feature for back-and-forth communication is challenging given the demand on the host organization to moderate content and battle foreign bots. We aim to incorporate the best features of tools such as iNaturalist and Zooniverse to support this function. Our plan is to add new code for a moderated content forum within the Symbiota database framework. This will be carried out by software developers at the Minnesota Supercomputing Institute with compensated users beta-testing the forum prior to release. Comments will be moderated by Bell Museum volunteers and/or student employees under staff supervision. In accomplishing this activity, Minnesota Wildflowers at the Bell Museum will complement and go well beyond other resources such as iNaturalist by offering a species identification tool based on high-quality, expert-curated images and species descriptions of Minnesota plants.

Activity Milestones:

Description	Approximate Completion Date
Database users, managers and developers consulted	December 31, 2024
Database software developed and beta-tested internally	December 31, 2025
Public release of moderated web forum for Minnesota Wildflowers Information	August 31, 2026

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
George Weiblen	Bell Museum, University of Minnesota	Senior personnel	No
Timothy Whitfeld	Bell Museum, University of Minnesota	Senior personnel	Yes
Michael Milligan	Minnesota Supercomputing Institute, University of Minnesota	Software developer	No
Thomas Prather	Minnesota Supercomputing Institute, University of Minnesota	Software developer	Yes
Katy Chayka	Minnesota Wildflowers Information	Special advisor	No
Linda Hardison	Oregon State University	Technical consultant coordinator	No
James Mickley	Oregon State University	Technical advisor and software developer	Yes
Katie Mitchell	Oregon State University	Technical assistant	Yes
Arthur Parker	Oregon State University	Technical advisor and software developer	Yes

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. The accessibility of Minnesota Wildflowers Information to non-experts has made it one of the most popular web products supported by the ENRTF. Securing a robust future home for Minnesota Wildflowers is the central objective of the project. Progress toward this goal will be communicated to audiences by several means. We will promote the availability of the information through Bell Museum programming, the Minnesota Biodiversity Atlas website, and an interactive kiosk in the main exhibit of the Bell Museum. We specifically target audiences including educators, naturalists (e.g. participants in the Minnesota Master Naturalist program), paraprofessionals and hobbyists (e.g., Minnesota Native Plant Society, Minnesota Master Gardeners, Minnesota Garden Clubs). Members of these groups will be recruited for beta testing of the new website. In addition, the new website will be tested by undergraduate students at the University of Minnesota enrolled in PMB4321: Minnesota Flora. The new Bell Museum in Saint Paul has increased public awareness of our state's official museum of natural history. The Environment and Natural Resources Trust Fund will be acknowledged through use of the trust fund logo or attribution language on the project web pages, print and electronic media, publications, signage, and other communications per the ENTRF Acknowledgement Guidelines.

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?

Expanding accessibility of the Biodiversity Atlas is of immediate and practical value to the public, educators, students, gardeners, natural resource managers, and state agencies. The Bell Museum, University of Minnesota Libraries, and Minnesota Supercomputing Institute are committed to long-term growth and maintenance of the Atlas as a way to build statewide relationships with agencies and academic partners. Project data are stored in the Data Repository at the University of Minnesota, which sets the highest standards for preservation of digital archives. The Bell Museum continues to be involved with biodiversity digitization and is committed to fundraising in support of these projects.

Other ENRTF Appropriations Awarded in the Last Six Years

Name	Appropriation	Amount Awarded
Minnesota Biodiversity Atlas - Phase 2	M.L. 2018, Chp. 214, Art. 4, Sec. 2, Subd. 03c	$350,000

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Bene fits	# FTE	Class ified Staff?	$ Amount
Personnel								
Tom Prather, Minnesota Supercomputing Institute		Developer			37%	0.3		$52,000
Timothy Whitfeld, Bell Museum		Collections Manager			37%	0.1		$11,000
Civil Service, Bell Museum		Curatorial Assistant			32%	1		$60,000
							Sub Total	**$123,000**
Contracts and Services								
Minnesota Supercomputing Institute services	Internal services or fees (uncommon)	Data hosting & server support. 6TB/year at $300/year for data & $2,600/year for server, adjusted for 3.85% annual inflation				0		$6,000
Oregon State University	Sub award	Software development		X		0		$51,000
							Sub Total	**$57,000**
Equipment, Tools, and Supplies								
							Sub Total	-
Capital Expenditures								
							Sub Total	-
Acquisitions and Stewardship								
							Sub Total	-

Travel In Minnesota								
	Miles/ Meals/ Lodging	$147 per person per day x 2 persons x 10 days x 2 field seasons, adjusted for 3.85% annual inflation	Per diem for project staff to collect field photographs					$6,000
	Miles/ Meals/ Lodging	$0.655 per mile x 2,000 miles per field season x 2 field seasons, adjusted for 3.85% annual inflation	Millage for project staff to collect field photographs					$3,000
							Sub Total	$9,000
Travel Outside Minnesota								
							Sub Total	-
Printing and Publication								
							Sub Total	-
Other Expenses								
		25 master naturalists, $200 stipend per participant per year x 2 years, adjusted for 3.85% annual inflation	Beta-testing participant payments					$10,000
							Sub Total	$10,000
							Grand Total	$199,000

Classified Staff or Generally Ineligible Expenses

Category/Name	Subcategory or Type	Description	Justification Ineligible Expense or Classified Staff Request
Contracts and Services - Oregon State University	Sub award	Software development	The role cannot be effectively fulfilled using in-state expertise because the integration involves developing the open-source software Symbiota to support the appearance and functions of Minnesota Wildflowers Information in the framework of the Biodiversity Atlas. A successful model already exists at OregonFlora (https://oregonflora.org/), a collaboration between Oregon State University and plant enthusiasts similar to what we proposed. We will consult with the developers of OregonFlora to borrow open-source code and develop new code as needed. This is more effective compared to developing the code from scratch using in-state expertise.

Non ENRTF Funds

Category	Specific Source	Use	Status	$ Amount
State				
In-Kind	University of Minnesota	Unrecovered indirect costs of this award (55% of $199,000 UMN direct costs)	Pending	$109,000
			State Sub Total	**$109,000**
Non-State				
Cash	National Science Foundation	Grant for digitizing lichen and bryophyte specimens in the Bell Museum Herbarium	Secured	$50,000
Cash	National Science Foundation	Grant for digitizing plant specimen records from the Bell Museum Herbarium	Secured	$33,000
Cash	National Science Foundation	Grant for digitizing North American tree records from the Bell Museum Herbarium	Pending	$108,000
			Non State Sub Total	**$191,000**
			Funds Total	**$300,000**

Attachments

Required Attachments

Visual Component

File: [eb60619a-0e7.pdf](eb60619a-0e7.pdf)

Alternate Text for Visual Component

The graphic illustrates how Minnesota Wildflowers Information and the Minnesota Biodiversity Atlas at the Bell will be integrated to make available photos and descriptions of >2,500 plant species. The proposed computer programming will create a user-friendly interface with functions for identifying plants and building community through a moderated content....

Supplemental Attachments

Capital Project Questionnaire, Budget Supplements, Support Letter, Photos, Media, Other

Title	File
Letter of support from OregonFlora	[b156bfd2-0c8.pdf](b156bfd2-0c8.pdf)
Letter of support from Minnesota Wildflowers Information	6ebbb7e0-bcb.pdf
Endorsement letter from the Board of Regents of the University of Minnesota	[b5fd4673-27d.pdf](b5fd4673-27d.pdf)

Media Links

Title	Link
Minnesota Biodiversity Atlas	https://bellatlas.umn.edu/

Difference between Proposal and Work Plan

Describe changes from Proposal to Work Plan Stage

No change has been made.

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, sale of products and assets, or revenue generation?
 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?
 No

Does the organization have a fiscal agent for this project?
 No

Does your project include the pre-design, design, construction, or renovation of a building, trail, campground, or other fixed capital asset costing $10,000 or more or large-scale stream or wetland restoration?
 No

Do you propose using an appropriation from the Environment and Natural Resources Trust Fund to conduct a project that provides children's services (as defined in Minnesota Statutes section 299C.61 Subd.7 as "the provision of care, treatment, education, training, instruction, or recreation to children")?
 No