



Environment and Natural Resources Trust Fund

2024 Request for Proposal

General Information

Proposal ID: 2024-206

Proposal Title: Preserving Minnesota Wildflower Information

Project Manager Information

Name: Ya Yang

Organization: U of MN - Bell Museum of Natural History

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Project Basic Information

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.

Funds Requested: \$199,000

Proposed Project Completion: August 31, 2026

LCCMR Funding Category: Small Projects (H)

Secondary Category: Foundational Natural Resource Data and Information (A)

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

Narrative

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.

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

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

Project Manager and Organization Qualifications

Project Manager Name: Ya Yang

Job Title: Assistant Professor and Curator of Plants

Provide description of the project manager's qualifications to manage the proposed project.

Ya Yang is a Curator of Plants in the Bell Museum and an Assistant Professor in the Department of Plant and Microbial Biology and teaches General Botany in the College of Biological Sciences. She earned a bachelor's degree from Peking University in 2001. She received her PhD degree from University of Michigan in 2012 and stayed on as a postdoctoral researcher before joining the University of Minnesota in 2016.

Dr. Yang has co-authored 30 peer-reviewed scientific articles, spanning botany and bioinformatics. Her work has been supported by seven grants and research contracts totaling \$1.4 million dollars from sources including the National Science Foundation, U.S. Army Corps of Engineers, and the Environment and Natural Resources Trust Fund.

Organization: U of MN - Bell Museum of Natural History

Organization Description:

The Bell Museum is Minnesota's official natural history museum, established by the state legislature in 1872 and held in trust by the University of Minnesota. For over 150 years, the museum has preserved and interpreted our state's rich natural history and served learners of all ages. Additionally, our scientific collections contain over one million specimens, representing every county in Minnesota and various locales around the globe. Collections are a source for Minnesota's biodiversity record, scientific research, and teaching materials at all levels of education. As Minnesota's state natural history museum, our mission is to ignite curiosity and wonder, explore our connections to nature and the universe, and create a better future for our evolving world.

We believe education is a journey and we delight in the process of hands-on discovery. We believe in authenticity to engage curiosity. We reflect and respect diversity. We seek to preserve knowledge and biodiversity for the future. We value our visitors and partners and seek collaboration to enrich learning. We strive for excellence in all that we do and we are principled in the way we take care of our people and planet.

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified 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	Professional or Technical Service Contract	Software development				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
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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](#)

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....

Optional Attachments

Support Letter, Photos, Media, Other

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

Administrative Use

Does your project include restoration or acquisition of land rights?

No

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?

No

Does the organization have a fiscal agent for this project?

No

Does your project include the design, construction, or renovation of a building, trail, campground, or other capital asset costing \$10,000 or more?

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?

No

