

Environment and Natural Resources Trust Fund 2018 Request for Proposals (RFP)

Project Title:**ENRTF ID: 004-A**

Minnesota Biodiversity Atlas: Phase II Expansion

Category: A. Foundational Natural Resource Data and Information**Total Project Budget:** \$ 496,000**Proposed Project Time Period for the Funding Requested:** 3 years, July 2018 to June 2021**Summary:**

We propose to double the size of a natural resource management tool, the Minnesota Biodiversity Atlas, by including state agency observations and specimen records from four additional museum collections.

Name: George Weiblen**Sponsoring Organization:** U of MN**Address:** 10 Church Street
Minneapolis MN 55414**Telephone Number:** (612) 282-8361**Email** gweiblen@umn.edu**Web Address** <https://www.bellmuseum.umn.edu/>**Location****Region:** Statewide**County Name:** Statewide**City / Township:****Alternate Text for Visual:**

The visual describes what has been accomplished in phase I of the project and what is proposed for phase II including the addition of 855,000 records from six different institutions and a smart device application for use in the field that will provide searchable access to a total of 1.5 million records, maps of species distributions, and high-resolution images of museum specimens..

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



I. PROJECT STATEMENT

We propose to double the size of a natural resource management tool, the Minnesota Biodiversity Atlas, by including state agency observations and specimen records from four additional museum collections.

The Minnesota Biodiversity Atlas (<http://bellatlas.umn.edu/>) is a publically accessible web application that enables users to map species distributions, create species checklists, view digital images, and search records. Phase I of this ENRTF project made accessible 630,000 records and 250,000 high-resolution digital images of Bell Museum specimens. In Phase II we propose to add:

- 300,000 observation records of animals and plants from the Minnesota Biological Survey (DNR MBS)
- 365,000 records of invertebrates and wetland plants from the Minnesota Pollution Control Agency (MPCA)
- 100,000 plant and animal specimen records from the University of Minnesota at Duluth (UMD)
- 50,000 bird and mammal specimen records from the Science Museum of Minnesota (SMM)
- 30,000 plant specimens from the College of St. Benedict/St. John's University (CSB/SJU)
- 15,000 plant specimens from Mankato State University (MANK)
- a mobile device application providing access to 1.4 million records in the field

As the state natural history museum, the Bell Museum has a statutory mandate to produce, preserve, and make biodiversity data available to the public. The Atlas complements the new Bell Museum and Planetarium in Saint Paul by serving these data online. The information is used by natural resource professionals (DNR & MPCA), educators, and the general public for activities including:

- accurate identification of species in the field (vegetation assessment, rare plant and animal surveys)
- checklists for user-defined areas (training, education, field surveys)
- species distribution maps (restoration planning, management, conservation)

The Atlas is currently limited to Bell Museum data including specimens collected by DNR and MPCA. **We propose to make additional expert observations of DNR and MPCA accessible through the Atlas. We also propose to put online other natural history collections in Minnesota. Lastly, we will expand the reach of the Atlas data by developing a mobile smart device application for offline use in the field.** Without phase II, natural resource professionals will continue to use separate data sets and consult collections separately, losing time and duplicating effort. Expanding the Atlas database and adding mobile functionality will increase accessibility to the biodiversity data that serves resource managers, professionals, educators, and citizens alike.

II. PROJECT ACTIVITIES AND OUTCOMES

Activity 1: Add Expert Observations to the Minnesota Biodiversity Atlas

Budget: \$93,000

We will expand the Atlas by adding expert observational data from the DNR MBS and the MPCA Environmental Analysis & Outcomes Division. MPCA surveys have accumulated observations of 100,000 fish, 240,000 stream and wetland macroinvertebrates, and 25,000 wetland plants. MBS survey data include more than 200,000 plant observations and 100,000 observations of birds, reptiles, amphibians, mammals, fish, mollusks and invertebrates. None of these digital records are publicly accessible online and together will dramatically improve the resolution of species distribution maps for Minnesota.

Outcome	Completion Date
1. Minnesota Biodiversity Atlas expanded to include expert observations	December 2018
2. 665,000 observations integrated with the Atlas	June 2019



Activity 2: Add records from participating natural history collections in greater Minnesota Budget: \$226,000

We will expand the Atlas to include specimens housed in the Science Museum of Minnesota, University of Minnesota Duluth, Mankato State, and St. Benedict/ St. John's. Together, these collections comprise 190,000 specimen records of Minnesota plants and animals that are not yet online, and will expand the current Atlas to a total of 820,000 specimens. We will digitally photograph plant specimens, animal specimen labels and their accompanying documentation. Text from label images will be transcribed using the Biodiversity Atlas.

Outcome	Completion Date
1. Duluth, Mankato State, and CSB/SJU images & records published	June 2020
2. Science Museum of Minnesota images & records published	June 2021

Activity 3: Create a customizable, mobile field Atlas that can be used anywhere. Budget: \$177,000

Natural resource professionals often require specimen images and data to identify species in the field or to determine whether a species is known from a particular area. The Atlas will be adapted for use on smart devices to serve as a portable field guide to Minnesota biodiversity with species lists and images. Since the complete Atlas is much too large for most mobile devices (phones or tablet computers), we will develop an application allowing users to download data and sets of images customizable by location or species similar to using Google maps offline in low data coverage areas.

Outcome	Completion Date
1. A mobile, online field guide to Minnesota's biodiversity data	June 2021

III. PROJECT STRATEGY

A. Project Team/Partners

Bell Museum curators contributing taxonomic expertise include: Keith Barker (birds), Sharon Jansa (mammals), Andrew Simons (fishes), Kenneth Kozak (amphibians and reptiles), George Weiblen Anita Cholewa, and Ya Yang (plants). Minnesota Supercomputing Institute personnel providing database and programming expertise are: Michael Milligan (UMN MSI project management) and Tom Prather (software development). Colleagues at data-contributing institutions coordinating image production and data transfer include: Bruce Carlson (MN Department of Natural Resources), Laurie Fink (Science Museum of Minnesota), Amanda Grusz (University of Minnesota, Duluth), Matthew Kaproth (Mankato State University) and Stephen Saupe (CSB/SJU).

B. Project Impact and Long-Term Strategy

The Atlas expansion proposed here will be of immediate, practical use to a diverse community of managers and scientists including field workers, ecologists, conservation planners, and policy makers as well as citizen scientists, educators, and the general public. In particular, addition of expert-gathered observational data into the Atlas will greatly expand the ability of Atlas users to create comprehensive summaries of Minnesota biodiversity across many taxonomic groups. The Bell Museum and University of Minnesota Libraries are committed to maintaining access to this resource for the long-term.

C. Timeline Requirements

This is a three-year project, and all activities will begin immediately upon project initiation. Capture and processing of new observational data will be completed by the end of the first year. Development of the mobile application will begin with end user surveys, design, and beta testing by the end of the second year, with the final application to be made available by the end of the third year. Specimen image capture and data entry will begin immediately and proceed throughout the course of the project.

2018 Detailed Project Budget

Project Title: Minnesota Biodiversity Atlas: Phase II Expansion

IV. TOTAL ENRTF REQUEST BUDGET 3 years

BUDGET ITEM	AMOUNT
Personnel:	\$ -
Michael Milligan, Atlas development supervisor (75% salary, 25% fringe) 5% FTE for 3 years (Total: 15% FTE)	\$18,000
Tom Prather, Atlas developer (75% salary, 25% fringe) 15% FTE for 3 years (Total: 45% FTE)	\$68,000
Anita Cholewa, plant digitization manager (67% salary, 33% fringe) 20% FTE for years 2 and 3 (Total: 40% FTE)	\$51,000
Mankato State student digitizer interns at UMN (\$10/hour, \$1/specimen, 10 specimens/hour, 11,000 specimens)	\$11,000
College of Saint Benedict/Saint John's University summer digitizer interns at UMN (\$10/hour, \$1/specimen, 10 specimens/hour, 30,000 specimens)	\$30,000
Graduate curatorial assistant (43% salary, 57% fringe) 50% FTE for years 2 and 3 (Total: 100% FTE)	\$89,000
Science Museum of Minnesota digitization manager (59% salary, 41% fringe) 50% FTE for years 2 and 3 (Total: 100% FTE)	\$59,000
Undergraduate student digitizers (UMN interns at SMM) (\$10/hour, \$1/specimen, 10 specimens/hour, 50,000 specimens)	\$50,000
University of Minnesota-Duluth digitization manager (79% salary, 21% fringe) 50% FTE for years 2 and 3 (Total: 100% FTE)	\$48,000
Undergraduate student digitizers (UMD) (\$10/hour, \$1/specimen, 10 specimens/hour, 50,000 specimens)	\$50,000
Service Contracts:	\$ -
Data hosting at MSI (3TB/year at \$750/year)	\$2,000
Server support at MSI (\$2,600/year)	\$8,000
Equipment:	\$ -
140,000 specimen barcode labels (50,000 SMM; 10,000 MANK; 30,000 CSB/SJU; 50,000 UMD)	\$1,000
2 specimen digitization stations (SMM and UMD) including a digital SLR camera, lightbox, barcode reader, desktop PC, and image processing software (\$5,000 each)	\$10,000
Additional Budget Items:	\$ -
specimen shipping costs (MANK and CSB/SJU to UMN and return)	\$1,000
TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND \$ REQUEST =	\$ 496,000

V. OTHER FUNDS

SOURCE OF FUNDS	AMOUNT	Status
Other Non-State \$ Being Applied to Project During Project Period: \$51,000 National Science Foundation, The Pteridological Collections Consortium: An integrative approach to pteridophyte diversity over the last 420 million years, \$39,000 National Science Foundation, Digitizing "Endless forms most beautiful and most wonderful": Facilitating Research on Imperiled Plants with Extreme Morphologies	\$90,000	Pending
Other State \$ To Be Applied To Project During Project Period:	N/A	
In-kind Services To Be Applied To Project During Project Period: <i>In-kind Services During Project Period: Personnel: Bell Museum (University of Minnesota) curatorial effort including Barker, Jansa, Kozak, Simons, Weiblen, & Ya at 3% FTE and Gruz (UMD) at 3% for each for three years. Includes 3% base salary per annum plus 36% fringe. Libraries (University of Minnesota) management and coordination by J. Nichols at 3% for each of three years and digital preservation services (10TB) at \$6500 per year</i>	\$ 109,000	Secured
Past and Current ENRTF Appropriation: <i>Integrating Minnesotas biodiversity data: a comprehensive, dynamic atlas, 2015-2018, unspent funds are obligated for the third and final year</i>	\$ 107,000	Obligated
Other Funding History: <i>LCMR, A computerized database for plants of Minnesota, 1991-1993, \$130,000 LCMR, Improved Minnesota fungus collection and database, 1999-2001, \$79,000, LCCMR Integrating Minnesotas biodiversity data: a comprehensive, dynamic atlas, 2015-2018, \$340,000</i>	\$ 442,000	

MINNESOTA BIODIVERSITY ATLAS

MAPPING CHANGE LOCALLY, GLOBALLY

PHASE —ONE—

BELL MUSEUM
640,000 records
COMPLETED



mammals
20,000



birds
50,000



plants
300,000



fishes
40,000



fungi
200,000



amphibians/reptiles
10,000



mollusks/crustaceans
20,000

PHASE —TWO—

AGENCIES
855,000 records
PROPOSED



Biological Survey
300,000



Pollution Control Agency
365,000



UMN Duluth
100,000



Science Museum of MN
50,000



MN State Mankato
10,000



St. Benedict/St. John's
30,000

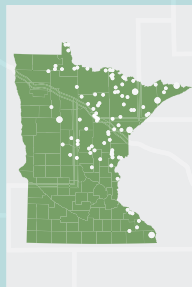
SEARCH

1,495,000 records



MAPS

Species Distribution



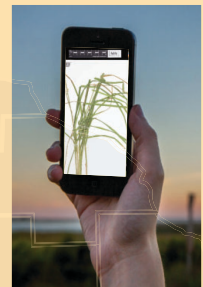
SPECIMENS

High-resolution images



FIELD GUIDE

Mobile App





Environment and Natural Resources Trust Fund (ENRTF)

2017 Main Proposal

Project Title: Minnesota Water Stories Told in Digital Planetariums

Project Manager Qualifications

George D. Weiblen

Address: 10 Church St. SE, Minneapolis MN, 55455, Fax 612-625-1738, Tel 612-624-3461, E-mail gweiblen@umn.edu

Professional preparation:

Reed College, Portland, Oregon B.A. in Biology, 1992

Harvard University, Cambridge, Massachusetts, A.M. in Biology, 1997, Ph.D. in Biology 1999

Professional appointments:

Bell Museum of Natural History, University of Minnesota, Minneapolis, Minnesota

Scientific Director (2015-present) and Herbarium Curator (2001-present)

Plant & Microbial Biology Department, University of Minnesota, St. Paul, Minnesota

McKnight Distinguished Professor (2014-present), Faculty (2001-present)

National Museum of Natural History, Smithsonian Institution, Washington, DC

Research Associate in Entomology and Botany (2001-2010)

Professional experience:

- Awarded and administered >20 grants and research contracts totaling \$3.7 million dollars from sources including ENRTF, NSF and NIH.
- Developed online biodiversity databases including the Minnesota Biodiversity Atlas.
- Published >65 peer-reviewed scientific articles.

Organization Description

The James Ford Bell Museum of Natural History was established by state legislative mandate in 1872 to collect, preserve, skillfully prepare, display, and interpret Minnesota's diverse animal and plant life for scholarly research and teaching and for public appreciation, enrichment and enjoyment. Its governance belongs, by state legislative designation, to the University of Minnesota. The scientific collections of the museum include over 1.4 million specimens of plants, animals, and fungi. The museum is a point of entry to U of M research, and is committed to serving students, teachers, families and adults by connecting them to the natural world and to participate in science through inquiry based learning, real objects, and direct contact with U of M researchers. In 2011, the Bell Museum joined with the Minneapolis Planetarium Society to expand its range of programming to include astronomy and earth science. The new Bell Museum and Planetarium on the Saint Paul campus at the University of Minnesota will open in summer 2018. This \$64 million dollar facility funded by the State of Minnesota, the University of Minnesota, and private donors will support environmental programming for all Minnesotans.

As Minnesota's state natural history museum, its mission is to ignite curiosity and wonder, explore our connections to nature, and create a better future for our evolving world. Our vision is centered on the principle that creativity and scientific literacy will flourish as people are inspired to ask about our place in the Universe.