

**Environment and Natural Resources Trust Fund
2017 Request for Proposals (RFP)**

Project Title:

ENRTF ID: 083-C

Minnesota Water Stories Told in Digital Planetariums

Category: C. Environmental Education

Total Project Budget: \$ 622,000

Proposed Project Time Period for the Funding Requested: 3 years, July 2017 - June 2020

Summary:

The Bell Museum will create an interactive planetarium program on water reaching over 400,000 citizens in Duluth, Marshall, Mankato, Minneapolis, Moorhead, Rochester, St. Paul and statewide through portable systems.

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Sponsoring Organization: U of MN - Bell Museum of Natural History

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Location

Region: Statewide

County Name: Statewide

City / Township:

Alternate Text for Visual:

Map showing locations of planetariums across Minnesota and schematic of a digital planetarium.

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



I. PROJECT STATEMENT

The University of Minnesota Bell Museum of Natural History and partners will create an interactive planetarium program on water that will reach over 300,000 students and 100,000 adults in 5 years. This flexible program will be featured at the Como Planetarium (St. Paul Schools), Mankato East High School Planetarium, Mayo High School Planetarium (Rochester Schools), Minnesota State University Moorhead Planetarium, Southwest Minnesota State University Planetarium (Marshall), at the new state funded Bell Museum Planetarium opening in St. Paul in 2018 and throughout Minnesota via the portable ExploraDome. Scientists from the University of Minnesota’s Water Resources Center, Institute on the Environment, and Large Lake Observatory will provide science content advisement.

Water flows out of Minnesota in three directions and our personal and public choices have impacts far beyond our borders. Understanding these impacts from a local to global perspective is necessary in order to address Minnesota’s water challenges of the present and future. Under a planetarium dome is the ideal place to learn and comprehend the serious challenges facing Minnesota’s water. *Why?* The shape of a dome fills our peripheral vision and mirrors the way our eyes see the world around us, making it easier to understand complex issues. The Bell Museum and partners will produce a live program to share through an existing network of planetariums and via two portable dome systems that can travel anywhere in the state. We will combine media, current and historic satellite data, and science results in these live presentations under the dome to support a statewide dialogue around water. The presentation is easily adjusted by a skilled planetarium presenter to accommodate the specific needs of the audience. Using compelling stories that we produce, we will guide citizens through a visual experience that transports them from outer space to inside a water molecule and all scales in between. Examples include:

- **Global Impacts:** A satellite view of the distribution of water across the planet and examples of how changing natural and human forces impact where people live and why so many people are, or will be, forced to move.
- **Regional impacts** specific to each of the three water basins which trisect Minnesota
 - **Dead Zone:** Satellite images of the impact of hypoxia in the Gulf of Mexico. A virtual flight into a field, where we meet a family farmer using satellite data to perform site specific crop management, and planting native vegetation as buffer along stream beds. This includes visualizations illustrating how nitrogen enhances plant growth and how it can be carried downstream.
 - **Great Lakes:** Satellite view of issues affecting the Great Lakes; e.g. invasive species, seasonally fluctuating lake levels, and ice cover. With a virtual flight onto the deck of the UMD Blue Heron research vessel, meet researchers and dive underwater to view fish populations, invasive species, and the role of seasonal ice.
 - **Algal blooms:** The increasing nutrient enrichment (eutrophication) of lakes across Minnesota shown through satellite views of water lake clarity and seasonal algal blooms. A virtual flight to a citizen lake monitor in a boat taking a secchi disk reading. Learn first-hand steps this cabin owner is taking to reduce runoff and remove phosphorus from her septic system. This includes a visualization that illustrates how phosphorus accumulates and moves through the system and ends up in our lakes and rivers.
- **Local impacts** on water - Ground water, point and non-point source pollution:
 - View impacts of land use changes as viewed from space over several decades. Fly into local examples illustrating how businesses, communities, and citizens are finding solutions. Meet students who have built a rain garden as part of their science class, road builders using porous asphalt, and a business owner who has implemented a “Zero discharge” 100% wastewater recycling system.

II. PROJECT ACTIVITIES AND OUTCOMES

Activity 1: Program Production

Budget: \$285,000

Write a script, collect and integrate data, film and produce segments, and create the technical structure that will allow presenters to interactively deliver the program. This includes collecting satellite and ground based data, creating necessary animations, and filming with a fulldome camera at featured locations around the state. The Bell



Environment and Natural Resources Trust Fund (ENRTF)

2017 Main Proposal

Project Title: Minnesota Water Stories Told in Digital Planetariums

Museum Production Team will collaborate with University researchers and partners to include the latest science-based results and data, to produce a program ready for testing with select audiences.

Outcome	Completion Date
1. Develop summary outline and set schedule for production and data collection/assembly.	September 15, 2017
2. Develop schedule for shooting full dome stories and creating animations.	October 15, 2017
3. Production Team writes script in partnership with University and community partners.	November 15, 2017
4. Secure data for visualization and establish procedures for integrating data into the dome.	November 15, 2017
5. Initial version is completed for purposes of testing with selected audiences.	January 15, 2018

Activity 2: Audience testing

Budget: \$168,000

Test-program with community and school groups located in each of Minnesota’s three drainage basins: Twin Cities, Duluth, and Moorhead. This program is intentionally designed to be modified and updated as needed. This will allow the presenter to include new data and media in order to address the audience needs and current events. This process will be objectively refined based on formative research conducted by the UMN Center for Applied Research and Educational Improvement (CAREI).

Outcome	Completion Date
1. Program testing with 30 classroom and 9 community groups in Twin Cities, Duluth and Moorhead.	May 15, 2018
2. Evaluators collect data to determine impacts on targeted test audiences.	August 15, 2018
3. Shooting of fulldome season specific footage continues.	November 15, 2018
4. Use evaluation results to refine script and customize it for each region.	January 15, 2019

Activity 3: Final production and state-wide distribution

Budget: \$169,000

Informed by the results of the program testing, we will complete the script and finish post production of final data and media elements in preparation for launch and promotion of program at each site and via the portable domes.

Outcome	Completion Date
1. Complete final script and post production of media.	August 15, 2019
2. Final version premieres at the new Bell Museum Planetarium.	October 15, 2019
3. Hold program delivery training for regional planetarium professionals.	January 15, 2020
4. Program is available for use at regional planetarium sites and via portable systems.	February 15, 2020
5. Evaluators collect data to determine impacts on audiences and submit final report.	June 30, 2020

III. PROJECT STRATEGY

A. Project Team/Partners

Bell Museum (UMN); Water Resources Center (UMN); Institute on the Environment (UMN); Marshall W. Alworth Planetarium (UMD); Large Lake Observatory (UMD); Center for Applied Research and Educational Improvement (UMN); and five additional planetariums across the state (listed above).

B. Project Impact and Long-Term Strategy

The final program will be an integrated program of the new Bell Museum + Planetarium and available across the state through regional planetarium partners. The program will increase the awareness and understanding of water issues that we face in Minnesota, regionally and at global scale. This program will be a template for the creation of future academic and community engagement efforts that help the University serve its statewide mandate of education and public outreach. We estimate reaching over 300,000 students and 100,000 adults in the first 5 years.

C. Timeline Requirements

A 36-month project schedule is recommended (July 2017 – June 2020). This timeline allows for filming in multiple seasonal cycles and for final production and release after the new Bell Museum opens in 2018. Year three will be primarily dedicated to implementation statewide via the planetarium network and portable systems.

2017 Detailed Project Budget

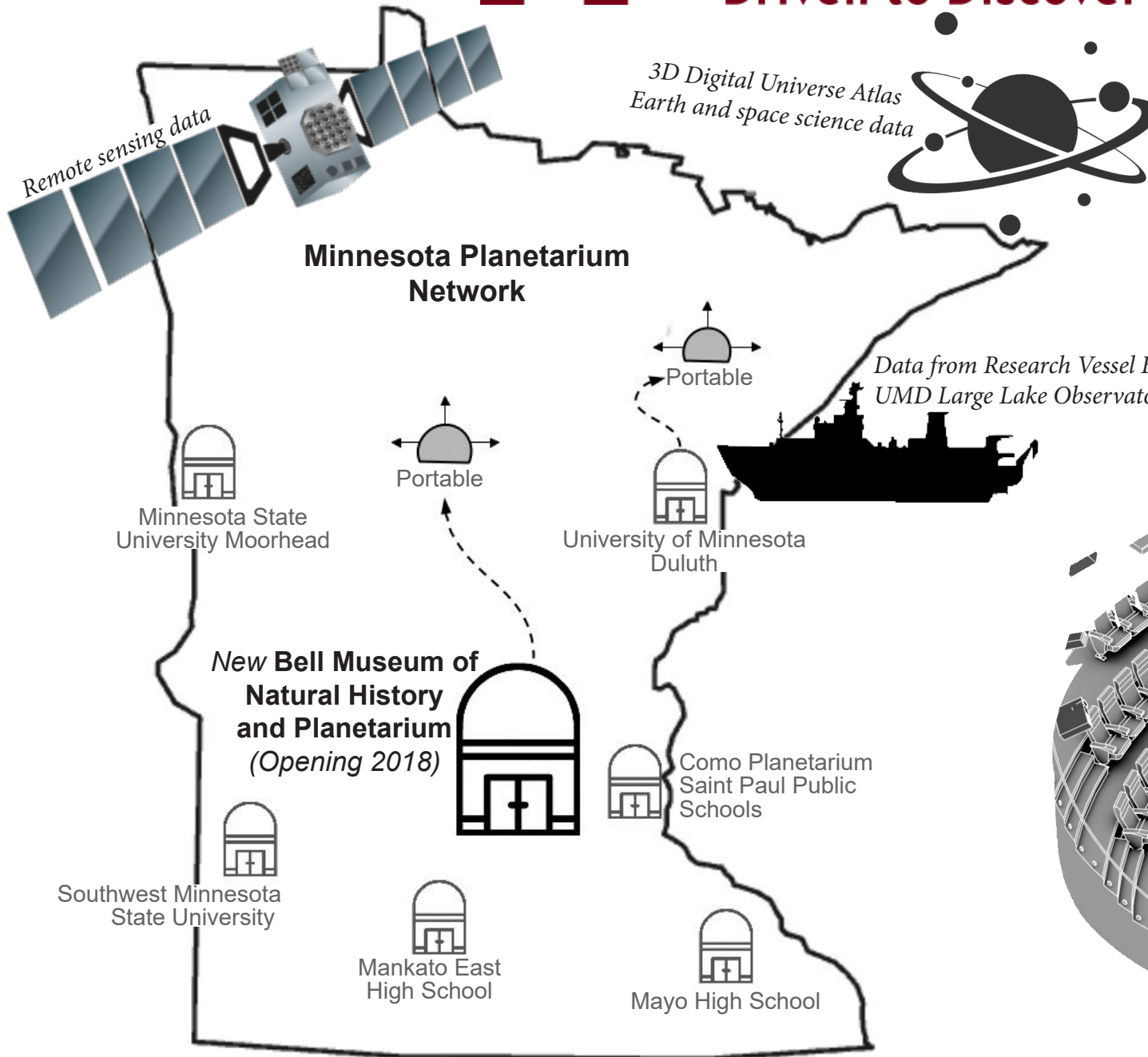
Project Title: **Minnesota Water Stories Told in Digital Planetariums**

IV. TOTAL ENRTF REQUEST BUDGET 3 years

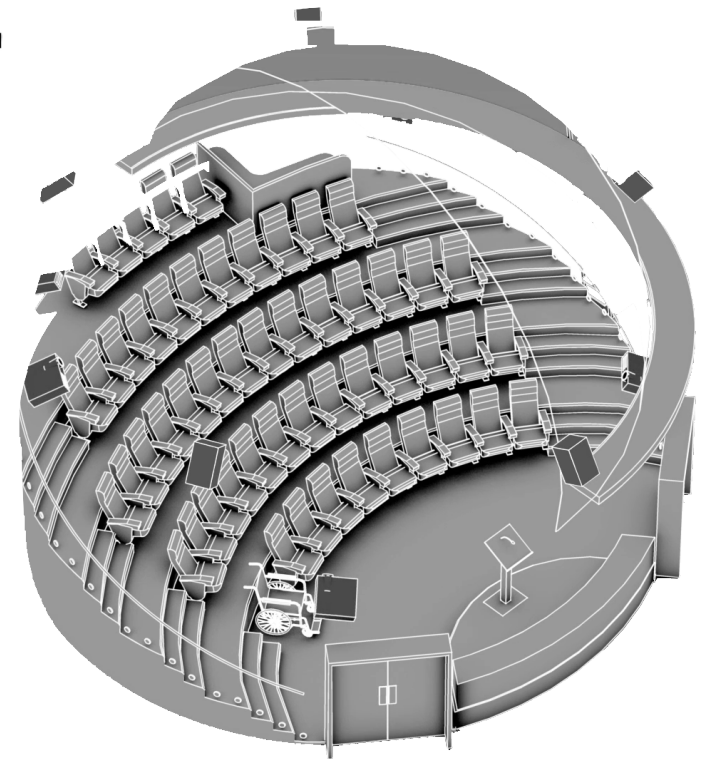
BUDGET ITEM	AMOUNT	
Personnel:		
Dr. Kate Brauman, Lead Scientist Global Water Initiative - UMN Institute on the Environment (75% salary, 25% benefits) 5% time FTE - <i>Science content and data advisor</i>	\$ 17,000	
Dr. Christopher Desjardins, Researcher - UMN Center for Applied Research and Educational Improvement (75% salary, 25% benefits) 15% time FTE - <i>Formative and summative program evaluation</i>	\$ 47,000	
Sally Brummel, Planetarium Manager - UMN Bell Museum of Natural History (75% salary, 25% benefits) 5% time FTE - <i>Project implementaion and management</i>	\$ 11,000	
Sara Komperud, Planetarium Educator- UMN Bell Museum of Natural History (80% salary, 20% benefits) 10% time FTE - <i>Program design and implementation</i>	\$ 16,000	
James Rock, Instructor and Planetarium Program Director - UMD Dept. Physics and Astronomy (80% salary, 20% benefits) 10% time FTE - <i>Program design and implementation</i>	\$ 24,000	
Lisa Sundberg, Outreach Coordinator - UMD Large Lake Observatory (80% salary, 20% benefits) 25%FTE Yr 1 12.5% FTE Yr 2-3 - <i>Program design, implementation and management</i>	\$ 22,000	
UMN Graduate student - Evaluation Assistant (46% salary, 54% benefits Academic Year; 85% salary, 15% benefits Summer) 50% time FTE	\$ 59,000	
UMN/UMD Undergraduate student presenters/workers 500 hrs/yr - <i>Program implementation</i>	\$ 17,000	
UMN Graduate student - Technical Support/Data Integration Manager (46% salary, 54% benefits Academic Year; 85% salary, 15% benefits Summer) 25% time FTE	\$ 21,000	
Professional/Technical/Service Contracts:		
Joel Halvorson - Science Communications Consultant - Executive Producer - 40% FTE - <i>Project design, development, and implementation</i> \$157,625 4 - Days videography on board the LLO Blue Heron @ \$5,000/day Aniation content producer \$78,800 -contract services for dome appropriate animations of key water processes	\$ 257,000	
Equipment/Tools/Supplies:		
Production harware and software \$15,000, Fulldome video camera at 6to8K resolution \$77,500, 50MP DSLR camera and fisheye lens \$6,000, Additional data storage \$5,000, Aerial drone octochopter with camera mount \$5,000, Media rights video/music \$5,000	\$ 114,000	
Travel:		
Directly related to production: \$5,000 (6 - 3 Day trips ~ \$250/day based on UMN travel reimbursement policy) - e.g. visits to farm site-visit, northwoods (citizen monitor), rural business and school site	\$ 17,000	
Directly related to evaluation: \$6,000 (4 - 3 Day trips ~ \$250/day based on UMN travel reimbursement policy) - travel to partner sites for 2 evaluators - Moorhead, Mankato, Duluth, Rochester		
Directly related to program testing: \$6,000 (4 - 3 Day trips ~ \$250/day based on UMN travel reimbursent) - 2 travelers to partner sites for initial community program - Moorhead, Mankato, Duluth, Rochester		
TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND \$ REQUEST =		\$ 622,000

V. OTHER FUNDS

SOURCE OF FUNDS	AMOUNT	Status
Other Non-State \$ To Be Applied To Project During Project Period:		
NASA Educational and Public Outreach Proposal - (2015 CP4SMPVC+) (\$1,053,480)	\$ 1,053,000	Pending
Other State \$ To Be Applied To Project During Project Period:		
	NA	
In-kind Services To Be Applied To Project During Project Period:		
Dr. Robert Sterner, Director - UMD Large Lake Observatory - (75% salary, 25% benefits) 1% time FTE - <i>Science content and data advisor</i> (\$6,812)	\$ 53,000	Secured
Dr. Marc Seigar, Professor and Department Head - UMD Dept. Physics and Astronomy - (80% salary, 20% benefits) 10% time FTE - <i>Program design and implementation</i> (\$41,317)		
Dr. George Weiblen, Scientific Director- UMN Bell Museum of Natural History - (75% salary, 25% benefits) 1% time FTE - <i>Science content and project administration</i> (\$4,875)		
Funding History:		
UMN IonE Mini Grant	\$ 3,000	Secured
Remaining \$ From Current ENRTF Appropriation:		



Minnesota Water Stories (local, regional, global) produced for interactive use in digital planetarium theaters around the state fostering important dialogue on water issues.





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 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 LCCMR, NSF and NIH.
- Participated in Bell Museum exhibit development, media production and public outreach for >15 years
- Published >65 peer-reviewed scientific articles including three in *Science* and *Nature*.

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 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 understanding scientific research 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, including the portable Exploradome planetarium program which state of the art data to immerse students and other learners around Minnesota in the universe in real time.

Groundbreaking for the new Bell Museum and Planetarium on the Saint Paul campus at the University of Minnesota is set for April 2016. This \$64 million dollar facility funded by the State of Minnesota, the University of Minnesota, and private donors will feature a state-of-the-art planetarium to 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.