Environment and Natural Resources Trust Fund (ENRTF)
M.L. 2017 LCCMR Work Plan

Date of Submission: September 14, 2016

Date of Next Status Update Report: January 15, 2018

Date of Work Plan Approval:

Project Completion Date: June 30, 2020

Does this submission include an amendment request? no

PROJECT TITLE: Minnesota Water Stories Told In Digital Planetariums

Project Manager: George Weiblen

Organization: Bell Museum of Natural History

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Email Address: gweiblen@umn.edu

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Location: Statewide

Total ENRTF Project Budget:	**ENRTF Appropriation:**	**$500,000**
	Amount Spent:	**$0**
	Balance:	**$500,000**

Legal Citation: M.L. 2017, Chp. xx, Sec. xx, Subd. xx

Appropriation Language:

I. PROJECT TITLE: Minnesota Water Stories Told In Digital Planetariums

II. 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 Marshall W. Alworth Planetarium (University of Minnesota Duluth), Como Planetarium (St. Paul Schools), Jackson Middle School Observatory (Anoka-Hennepin 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 two portable planetariums in the University of Minnesota system. Scientists from the University of Minnesota's Water Resources Center, Institute on the Environment, and Large Lake Observatory will provide science advisement to ensure accuracy of the program content. The University of Minnesota Center for Applied Research and Educational Improvement (CAREI) will perform formative and summative evaluation of the planetarium program to determine its effectiveness in meeting its intended learning outcomes.

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. Seeing the presentation in the immersive environment of the planetarium theater allows the audience to feel as they are part of the story, connected to the decisions made by others and themselves.

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. The production team 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 partners produce, presenters 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 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.

III. OVERALL PROJECT STATUS UPDATES:

Project Status as of January 15, 2018*:*

Project Status as of July 15, 2018*:*

Project Status as of January 15, 2019*:*

Project Status as of July 15, 2019:

Project Status as of January 15, 2020:

Overall Project Outcomes and Results:

IV. PROJECT ACTIVITIES AND OUTCOMES:

ACTIVITY 1: Program Production
Description:
For the production of *Minnesota Water Stories*, the production team will 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 existing satellite and ground based data, creating necessary animations, and filming with a fulldome camera at featured locations around the state. The Bell 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.

The production team will test a prototype version of *Minnesota Water Stories* with selected audiences in the first year of the activity period. The purpose of the prototype is to determine its effectiveness in meeting intended learning outcomes defined in Activity 2 and refine the script as necessary. The production will take place from July 2017 through January 2018. The team will begin with writing a summary outline of the script, including consultation with the project science consultants to incorporate the latest science-based results and data. The science will greatly drive the content in the script, so this consultation will inform the direction and schedule of completing the subsequent tasks of data collection and integration, creating new animations, and filming relevant sequences around the state.

The sections of the script are separated into content areas that represent our understanding of water at a variety of scales.
Cosmic: By taking a flight through the universe using a 3D digital atlas of astronomical data, the audience will learn about the distribution of water in our solar system, that it is mostly trapped in ice on various types of worlds, and the special characteristics of Earth that allow water to be in liquid form on the surface and thus be the only planet we know to support life. Water is not created or destroyed on planets like Earth. We have a fixed amount, and we must manage it wisely.
Global: The audience will see 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. We will also discuss the water cycle, and how water can move long distances in the atmosphere but it often stays closer to home, when it lands on Earth's surface as liquid water.
Regional: Impacts specific to each of the basins that trisect Minnesota and drain into three major bodies of water.

1. The Minnesota River, Lower Mississippi, Upper Mississippi, and St. Croix River basins, where water drains into the Gulf of Mexico.
Nitrogen coming from human activities upstream causes hypoxia, or a depletion of oxygen, causing dead zones which can no longer support living organisms, which is revealed by satellite ocean color remote sensing. One source of excess nutrients are farms, and farmers are taking action to make sure they most efficiently use nitrogen fertilizer, which both maximizes their crop yield and benefits the environment. One method is to use NASA and the U.S. Geological Survey's Landsat satellites to pinpoint where nitrogen is depleted, so farmers can use it only where it is necessary, and not over the entire field. This program segment will include a visualization of the process, including a view from the satellites to an aerial flight over their field, illustrations of how nitrogen enhances planet growth and can be carried downstream, and a discussion with the farmer about how they use this for crop management.
Other solutions featured during the presentation in the Twin Cities will be discussions on how houses right here in the metro use native vegetation buffers to intercept stormwater runoff and minimize sediment and pollution carried into both rivers and nearby lakes.

2. Lake Superior and its basin, the headwaters of all of the Great Lakes.
Lake Superior holds 10% of Earth's accessible freshwater. It is one of the most rapidly warming lakes on Earth, and there are long-term changes to the ecosystem that might be resulting from this stressor. The production team will combine satellite views with footage of researchers exploring different facets of this ecosystem to illustrate issues affecting the Great Lakes such as invasive species, seasonally fluctuating lake levels, and ice cover. With a virtual flight over the deck of the University of Minnesota Duluth research vessel Blue Heron, audiences will meet researchers and dive underwater to view fish populations, invasive species, and the role of seasonal ice. The Minnesota Pollution Control Agency has identified key principles of management of the Lake Superior basin, focusing on water resource priorities, environmental outcomes, customer/public involvement, and integrating pollution reduction strategies for point and nonpoint sources. The program in Duluth will include a conversation about these principles.

3. The Red River of the North and Rainy River basins, which drain to Lake Winnipeg.
The increasing eutrophication (nutrient enrichment) of lakes across Minnesota due to excess phosphorus causes algal blooms which can produce toxins harmful to life, both human and aquatic. The program will include a visualization of how phosphorus is carried into rivers and lakes in sediment from urban and rural practices. Satellite views show us the seasonal algal blooms and water lake clarity. Citizens monitor lakes on a local scale with secchi disk readings, which scientists use to calibrate satellite imagery and make statewide monitoring more efficient. Assessing the water quality in the region is essential for effective environmental planning and management, and audiences in Moorhead will discuss these methods. The use of historic satellite data from back to the 1970s combined with existing data collection efforts and satellite land-use data can help determine the impacts different land-use practices have on lake conditions on a comprehensive regional scale.

Local: Audiences will see what specific issues are impacting their communities, how their local businesses and fellow citizens are taking action, and how they can join in. For example,

- Students building a rain garden
- Road builders using porous asphalt
- Businesses implementing zero discharge 100% wastewater recycling systems

The outcomes for this activity are the successful completion of each of the items listed 1-5.

Milestone dates for completing each of these tasks are listed in the outcomes table.

Summary Budget Information for Activity 1:

ENRTF Budget: $ 217,000
Amount Spent: $ 0
Balance: $ 217,000

Outcome	Completion Date
1. Summary outline and schedule for production and data collection complete	September 15, 2017
2. Schedule for shooting fulldome stories and creating animations complete	October 15, 2017
3. Script complete	November 15, 2017
4. Data for visualizations and procedures established for integrating data into the dome secured	November 15, 2017
5. Initial version for testing with selected audiences complete	January 15, 2018

Activity 1 Status as of January 15, 2018*:*

Activity 1 Status as of July 15, 2018*:*

Activity 1 Status as of January 15, 2019*:*

Activity 1 Status as of July 15, 2019:

Activity 1 Status as of January 15, 2020:

Final Report Summary:

ACTIVITY 2: Audience Testing and Evaluation

Description: Evaluate prototype program and final production with planetarium professionals and community and school groups. This program is intentionally designed to be modified and updated as needed. This will allow the presenters to adapt to address audience needs, and current events. This process will be iteratively refined based on formative and summative feedback provided by the UMN Center for Applied Research and Educational Improvement (CAREI).

The intended outcomes for planetarium professionals are:

- Building knowledge of social-ecological issues;
- Building ability to deliver a presentation about Minnesota's waters;
- Viewing domes as a tool for communicating about social-ecological issues and systems (not
- just space science);
- Increasing programming about Minnesota's water in planetariums;
- Building relationships with community partners and external advisors.

For public attendees, school and community groups, the intended outcomes include:

- Increase in awareness of challenges facing Minnesota's waters;
- Have a positive affective/emotional response (i.e., awe, inspiration, amazement);
- Understand new relationship(s) of ecological problems to larger systems (e.g., the cosmic, global, regional, and local impacts);
- Have awareness of community resources / opportunities to work toward addressing the social-ecological problems.

The first round of evaluation—Phase 1-- will gather information about the prototype program presented in planetariums located in each of Minnesota's three drainage basins: Twin Cities, Duluth, and Moorhead. CAREI

will interview planetarium professionals (3 total), will survey and hold focus groups with program participants from the general public (up to 150 for the survey and 24 for the focus groups), and will survey students from classrooms (approximately 225.)

The formative evaluation from Phase 1 will inform the production of the final program. Once the final production is complete, it will be presented in 9 planetariums around the state and evaluated again—Phase 2--for a summative report. The survey designed and administered during Phase 1 will be refined to reflect changes to the program between phases, and then administered to public attendees and students from local schools. Approximately 450 community members from 9 planetariums, and 225 students from 3 planetariums are expected to take the survey. The survey will be refined to gather objective, summative data from program participants about the affect program participation had on: a) changes in their awareness of the challenges facing Minnesota's waters; b) their emotional response and interest in issues facing Minnesota's waters; c) their awareness of resources and opportunities available to address social-ecological issues, particularly issues related to Minnesota's waters.

During all stages of the evaluation, CAREI staff will work closely with Bell Museum project staff to design and refine all interview, focus group, and survey questions. CAREI will provide project staff with relevant formative and summative feedback in a timely manner.

Summary Budget Information for Activity 2:

ENRTF Budget: $ 112,000
Amount Spent: $ 0
Balance: $ 112,000

Outcome	Completion Date
1. Prototype testing with focus groups and surveys at each site	May 31, 2018
2. Interviews with planetarium professionals at each site	June 30, 2018
3. Deliver formative evaluation report to project staff	September 1, 2018
4. Final production testing at each site	May 31, 2020
5. Deliver summative evaluation report to project staff	June 30, 2020

Activity 2 Status as of January 15, 2018*:*

Activity 2 Status as of July 15, 2018*:*

Activity 2 Status as of January 15, 2019*:*

Activity 2 Status as of July 15, 2019:

Activity 2 Status as of January 15, 2020:

Final Report Summary:

ACTIVITY 3: Final Production and Implementation State-wide

Description:
Informed by the results of the program testing, the production team 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.

CAREI will complete the analysis of the data collected from the prototype production testing by September 1, 2018, and the production team will use these results to refine the script as necessary. The team will also customize the script for each region of the state, with consultation from the regional planetarium directors and members of their communities. The script revision will be complete by January 15, 2019.

Concurrent with the script revision, the production team will continue to gather new footage, animations, and data, and will complete the final production on August 15, 2019. The prototype production will only include video footage from one season, fall 2017, so shooting of fulldome season specific footage continues through summer 2019 to ensure two full seasonal cycles.

Minnesota Water Stories will premier to public audiences in the Bell Museum Planetarium in October 2019. The presentation will include a dialogue with the scientists who contributed to the production, as well as representatives of the community who are finding solutions to Minnesota's water issues. After the premier, the program will be available at the Bell Museum Planetarium for school and public audiences.

The Bell Museum production and education staff will hold training for program delivery with the regional planetarium professionals in winter 2020.

In February 2020, the program will be available to audiences across Minnesota, through the nine planetariums in the network, as well as in the two portable planetariums that can travel anywhere in the state. The Bell Museum planetarium staff will continue to work with the regional planetarium directors to keep the content up to date with new science results and community solutions that are unique to their regions. This is a part of the sustainability of the program, as the Bell is committed to maintaining programmatic partnerships with the members of the network on a continuing basis.

Summary Budget Information for Activity 2:

ENRTF Budget: $ 171,00
Amount Spent: $ 0
Balance: $ 171,000

Outcome	Completion Date
1. Use evaluation results to refine script and customize it for each region.	January 15, 2019
2. Complete final production	August 15, 2019
3. Final production premieres at Bell Museum Planetarium	October, 2019
4. Program delivery training for planetarium professionals	January 15, 2020
5. Program available for use at regional planetarium sites and via portable systems.	February 28, 2020

Activity 3 Status as of January 15, 2018*:*

Activity 3 Status as of July 15, 2018*:*

Activity 3 Status as of January 15, 2019*:*

Activity 3 Status as of July 15, 2019:

Activity 3 Status as of January 15, 2020:

Final Report Summary:

V. DISSEMINATION:

Description:
The Project Manager and project partners will present the results of this project at regional and national planetarium and education conferences, such as the Minnesota Conference on Science Education and the Great Lakes Planetarium Association, and National Science Teachers Association.
The team will write an article to be submitted to the journal *The Planetarian*.
University of Minnesota Relations will provide press releases at key milestones of the project, such as the premiere of *Minnesota Water Stories* at the Bell Museum Planetarium in October 2019.
The program production will be available for planetariums beyond those participating in the project to use, in whole or in part, for their institutions. This will be sent as a digital file, upon request.
Status updates will be provided through social media sites

- Facebook www.facebook.com/BellMuseum
- Twitter @bellmuseum

Status as of January 15, 2018*:*

Status as of July 15, 2018*:*

Status as of January 15, 2019*:*

Status as of July 15, 2019:

Status as of January 15, 2020:

Final Report Summary:

VI. PROJECT BUDGET SUMMARY:
A. Preliminary ENRTF Budget Overview:
***This section represents an overview of the preliminary budget at the start of the project. It will be reconciled with actual expenditures at the time of the final report.**

Budget Category	$ Amount	Overview Explanation
Personnel:	$ 139,000	Personnel costs include 1) 5% FTE each year for 3 years for the UMN IonE Global Water Initiative scientist 2)10% FTE each year for 3 years for the Planetarium Manager at the Bell Museum *1-2 at 75% salary and 25% benefits* 3-4) 10% time each year for 3 years Planetarium Educators at the Bell Museum and University of Minnesota Duluth 5) 25% FTE year one and 12.5% FTE years 2-3 for the UMD Large Lake Observatory Outreach Coordinator *3-5 at 80% salary and 20% benefits* 6) 25% FTE each year for 3 years for one technical support graduate student at 46%

		salary, 54% benefits Academic Year; 85% salary, 15% benefits Summer 7) 5% FTE each year for 3 years for undergraduate students at the Bell Museum and University of Minnesota Duluth planetariums at 100% salary
Professional/Technical/Service Contracts:	$314000	$158,000 over three years for the executive producer of the planetarium program at 40% FTE; $61,000 for evaluation by the University of Minnesota Center for Applied Research and Educational Improvement including 33% FTE total for 3 years; $20,000 for four days videography on board the Large Lake Observatory Blue Heron research vessel $75,000 over three years for an animation content producer at 25% FTE.
Equipment/Tools/Supplies:	$30,000	$6,000 for media and music rights for the planetarium program; $4,000 for two production computers, $2,000 for production software and $2,000 for external data storage hardware; $6,500 for professional fulldome video cameras, $4500 for 50 MP DSLR camera with fisheye lens, and $5,000 for aerial drone and camera mount.
Capital Expenditures over $5,000:	$0	
Fee Title Acquisition:	$0	
Easement Acquisition:	$0	
Professional Services for Acquisition:	$0	
Printing:	$1,000	Printing at $0.12 per page
Travel Expenses in MN:	$16,000	35 3 day/2 night trips around greater Minnesota for production, program testing, and evaluation; including lodging, meals, rental car, and gasoline
Other:	$0	
TOTAL ENRTF BUDGET:	**$500,000**	

Explanation of Use of Classified Staff: N/A

Explanation of Capital Expenditures Greater Than $5,000: N/A

Total Number of Full-time Equivalents (FTE) Directly Funded with this ENRTF Appropriation: 2.5

Total Number of Full-time Equivalents (FTE) Estimated to Be Funded through Contracts with this ENRTF Appropriation: 2.3

B. Other Funds:

Source of Funds	$ Amount Proposed	$ Amount Spent	Use of Other Funds
Non-state			
University of Minnesota in-kind	$6,812	$	Dr. Robert Sterner, Director - UMD Large Lake Observatory - (75% salary, 25% benefits) 1% time FTE - Science content and data advisor
University of Minnesota in-kind	$41,317		Dr. Marc Seigar, Professor and Department Head - UMD Dept. Physics and Astronomy - (80% salary, 20% benefits) 10% time FTE - Program design and implementation
University of Minnesota in-kind	$4,875		Dr. George Weiblen, Scientific Director- UMN Bell Museum of Natural History - (75% salary, 25% benefits) 1% time FTE - Science content and project administration
State			
	$0	$	
TOTAL OTHER FUNDS:	**$53,000**	**$**	

VII. PROJECT STRATEGY:

A. Project Partners:

Partners receiving ENRTF funding

- Dr. Kate Brauman, Lead Scientist, Global Water Initiative, Institute on the Environment, University of Minnesota, $17,407, Science content and data advisor
- Sally Brummel, Planetarium Program Manager, Bell Museum of Natural History, $22,516, Project implemenation and management
- Sarah Komperud, Planetarium Educator, Bell Museum of Natural history, $15,465, Program design and implementation
- James Rock, Instructor and Planetarium Program Director, University of Minnesota Duluth Department of Physics and Astronomy, $24,098, Program design and implementation
- Lisa Sundberg, Outreach Coordinator, University of Minnesota Duluth Large Lake Observatory, $22,153, program design, implementation, and management
- University of Minnesota graduate student, $20,615, technical supprot and data integration manager
- University of Minnesota Twin Cities and Duluth undergraduate students, $16,912, Program implementation

Partners NOT receiving ENRTF funding

Regional Planetarium Directors:

- Dave Burgess, Planetarium Director, Mankato East High School
- John Iverson, Planetarium Director, Como Planetarium
- Paul Larson, Planetarium Director, Mayo High School
- Ken Murphy, Planetarium Director, Southwest Minnesota State Universty Planetarium
- Ronald Schmit, Observatory Coordinator, Jackson Middle School
- Sara Schultz, Planetarium Coordinator, Minnesota State University Moorhead Planetarium

B. Project Impact and Long-term Strategy:

Part of the Bell Museum's mission is to explore our connections to nature and the universe and create a better future for our evolving world. This compliments one of the purposes of the Environment and Natural Resources Trust Fund, to "protect, conserve, preserve, and enhance Minnesota's air, water, land, fish, and other natural resources for the benefit of current citizens and future generations." Citizens who see *Minnesota Water Stories* will increase awareness of challenges facing Minnesota's waters and gain awareness of community resources and opportunities to work toward addressing the social-ecological problems. When the new Bell Museum and Planetarium opens in 2018, annual attendance is projected to more than double, and combining that with the reach of this program across the planetarium network, the population of citizens who understand water challenges and will be inspired to act will increase by the thousands. *Minnesota Water Stories* will be available for school and public audiences statewide beyond the funding period.

This project presents the opportunity to build on the NASA-Funded "Immersive Earth" project, where five teams of planetarium professionals and middle school educators worked together to create Earth science lessons for the classroom and planetarium. While *Minnesota Water Stories* is not written explicitly for middle school audiences, the educators can utilize the script, data, and animations, in part or in whole, in combination with other resources, to create a program that would fit into a middle school curriculum. Planetarium professionals and educators are already skilled at creating new programs from existing materials, and so *Minnesota Water Stories* will provide a new set of resources.

Bell Museum stakeholders have concerns about water conservation issues and we will seek their partnership to sustain the programming effort, whether it be reaching new audiences and/or production of new content.

C. Funding History: N/A

VIII. REPORTING REQUIREMENTS:

- The project is for 3 years, will begin on 07/01/17, and end on 06/30/20.
- Periodic project status update reports will be submitted January 15 and July 15 of each year.
- A final report and associated products will be submitted between June 30 and August 15, 2020.

IX. VISUAL COMPONENT or MAP(S):
See attached graphic

X. FEE TITLE ACQUISITION/CONSERVATION EASEMENT/RESTORATION REQUIREMENTS: Not applicable

Environment and Natural Resources Trust Fund
M.L. 2017 Project Budget

Project Title: Minnesota Water Stories Told In Digital Planetariums

Legal Citation: *Fill in your project's legal citation from the appropriation language - this will occur after the 2017 legislative session.*

Project Manager: George Weiblen

Organization: University of Minnesota - Bell Museum of Natural History

M.L. 2017 ENRTF Appropriation: **$**00,000

Project Length and Completion Date: 3 Years, June 30, 2020

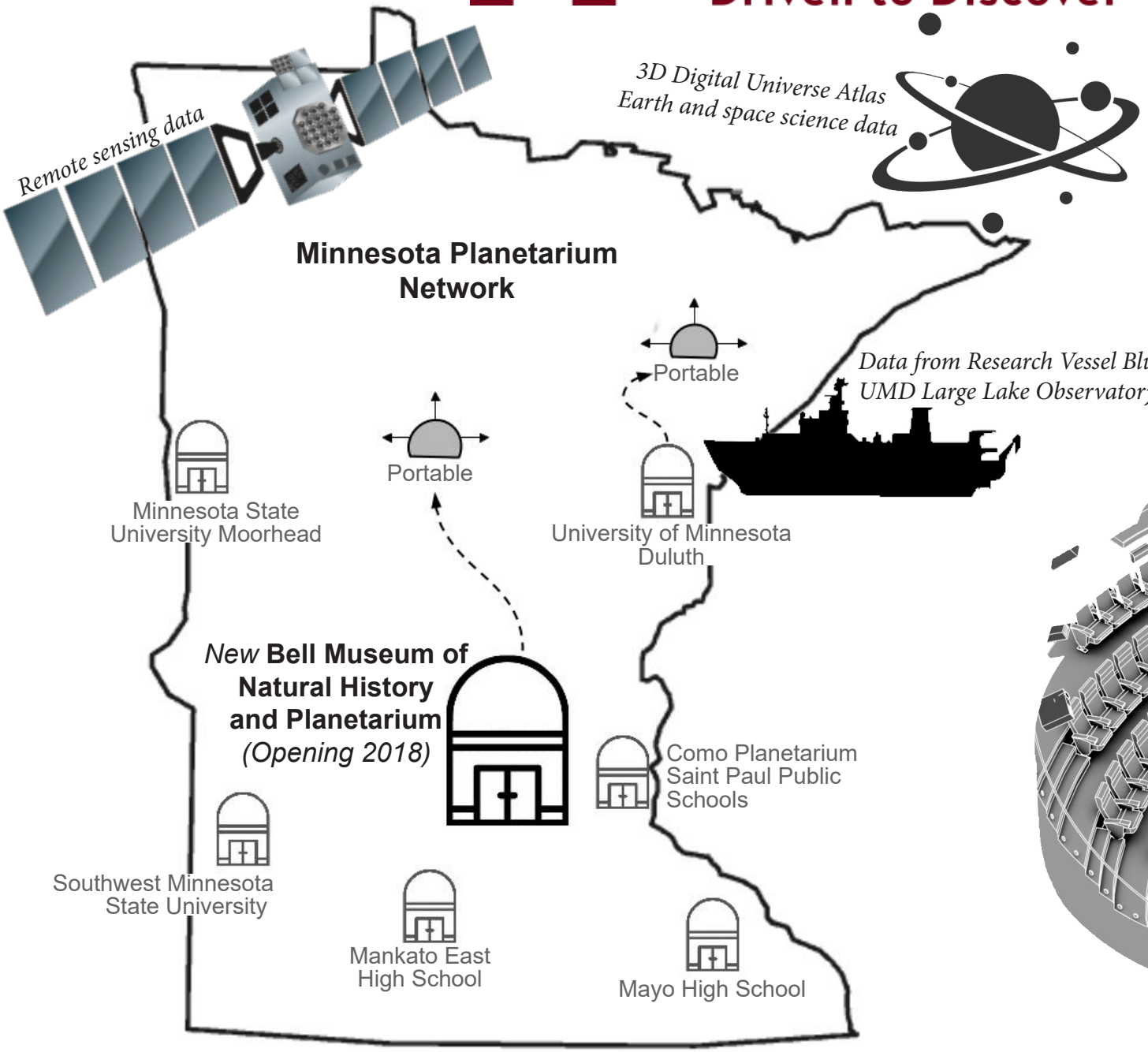
Date of Report: September 14, 2016

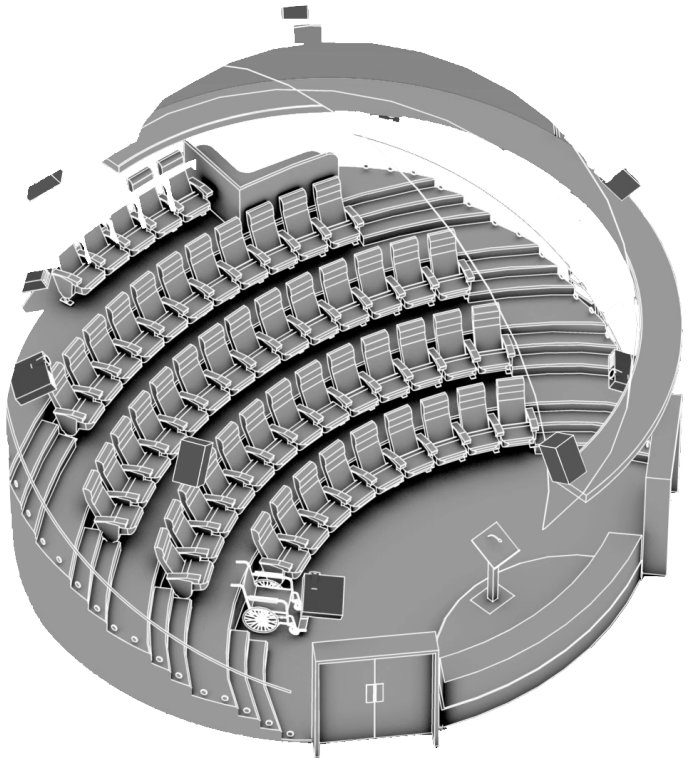
ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET	Activity 1 Budget	Amount Spent	Activity 1 Balance	Activity 2 Budget	Amount Spent	Activity 2 Balance	Activity 3 Budget	Amount Spent	Activity 3 Balance	TOTAL BUDGET	TOTAL BALANCE
BUDGET ITEM	**Program Production**			**Audience Testing and Evaluation**			**Final Production and Implementation State-**				
Personnel (Wages and Benefits)	**$61,000**	**$0**	**$0**	**$35,000**	**$0**	**$0**	**$43,000**	**$0**	**$0**	**$139,000**	
Dr. Kate Brauman, Lead Scientist Global Water Initiative - UMN Institute on the Environment (75% salary, 25% benefits) 5% time FTE each year for 3 years- Science content and data advisor ($17,000)										$0	
Sally Brummel, Planetarium Manager - UMN Bell Museum of Natural History (75% salary, 25% benefits) 10% time FTE each year for 3 years - Project implementation and management ($23,000)											
Sarah Komperud, Planetarium Educator- UMN Bell Museum of Natural History (80% salary, 20% benefits) 10% time FTE each year for 3 years - Program design and implementation ($15,000)											
James Rock, Instructor and Planetarium Program Director - UMD Dept. Physics and Astronomy (80% salary, 20% benefits) 10% time FTE each year for 3 years - Program design and implementation ($24,000)											
Lisa Sundberg, Outreach Coordinator - UMD Large Lake Observatory (80% salary, 20% benefits) 25%FTE Yr 1 12.5% FTE Yr 2-3 - Program design, implementation and management ($22,000)											
UMN/UMD Undergraduate student presenters/workers 100 hrs/yr for 3 years- Program implementation ($17,000)											
UMN Graduate student - Technical Support/Data Integration Manager (46% salary, 54% benefits Academic Year; 85% salary, 15% benefits Summer) 25% time FTE each year for 3 years ($21,000)											
Professional/Technical/Service Contracts	**$120,000**	**$0**	**$0**	**$69,000**	**$0**	**$0**	**$125,000**	**$0**	**$0**	**$314,000**	

Joel Halvorson, Science Communication Consultant, Executive Producer, 40% FTE each year for 3 years	$75,000			$8,000			$75,000			$158,000	
CAREI, Evaluation				$61,000						$61,000	
4 days videography on board LLO Blue Heron	$20,000									$20,000	
Animation content producer for animations of key water proces TBD, 25% FTE each year for 3 years	$25,000						$50,000			$75,000	
Equipment/Tools/Supplies	**$30,000**									**$30,000**	
Media and music rights ($6,000)											
Production Software ($2,000)											
Production Computers (2) (4,000)											
Data storage ($2,000)											
Fulldome Video Camera--GoPro Omni+ ($5,000)											
Fulldome Video xcamera -- Kodak PIXPRO (2 plus solo mount) ($1,500)											
50MP DSLR Camera ($3,500)											
Fisheye lens ($1,000)											
Aerial drone octocopter ($2,000)											
Camera mount ($3,000)											
Printing				**$1,000**						**$1,000**	
Printing at $0.12/page ($1,000)											
Travel expenses in Minnesota	**$6,000**			**$7,000**			**$3,000**			**$16,000**	
Travel: 35 3 day/2 night trips at $350/trip based on UMN travel reimbursement policy Directly related to production: $4,200 (6 trips for 2 travelers - e.g. visits to farm site-visit, northwoods citizen monito), rural business and school site) Directly related to evaluation: $4,900 (7 trips for 2 travelers to partner sites - Moorhead and Duluth--2 trips each, Mankato, Marshall and Rochester--1 trip each) Directly related to program testing: $1,400 (2 trips for 2 travelers to partner sites for initial community program - Moorhead and Duluth); Directly related to program implementation: $1,750 (5 trips for 1 traveler to partner sites - Moorhead, Duluth, Mankato, Rochester and Marshall) Rental car, 60 days at $50/day $3000 Gas 1200	$6,000			$7,000			$3,000			$16,000	
Other										**$0**	
COLUMN TOTAL	**$217,000**	**$0**	**$0**	**$112,000**	**$0**	**$0**	**$171,000**	**$0**	**$0**	**$500,000**	

UNIVERSITY OF MINNESOTA
Driven to Discover℠

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





The Bell Museum of Natural History is part of the University of Minnesota College of Food, Agriculture and Natural Resource Sciences (CFANS)