Environment and Natural Resources Trust Fund
2019 Request for Proposals (RFP)

Project Title: **ENRTF ID: 126-C**

Enhancing Water Quality Education with Inquiry and Research

Category: C. Environmental Education

Sub-Category:

Total Project Budget: $ 279,684

Proposed Project Time Period for the Funding Requested: June 30, 2022 (3 yrs)

Summary:

Educational curricula are most effectively delivered through hands-on, real-world experience. Involving students and citizens in gathering and interpreting information at the Bell Museum, this project will enliven water quality education.

Name: Jacques Finlay

Sponsoring Organization: U of MN

Title: professor

Department: College of Biological Sciences, Department of Ecology, Evolution and Behavior

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Location

Region: Statewide

County Name: Statewide

City / Township:

Alternate Text for Visual:

Image shows map of Bell Museum grounds, with pictures of students doing hands on activities and citizen scientists, and description of activities 1 & 2..

_____ Funding Priorities	_____ Multiple Benefits	_____ Outcomes	_____ Knowledge Base
_____ Extent of Impact	_____ Innovation	_____ Scientific/Tech Basis	_____ Urgency
_____ Capacity Readiness	_____ Leverage	_____ TOTAL	_____%
____ If under $200,000, waive presentation?			

PROJECT TITLE: Enhancing Water Quality Education with Inquiry and Research

I. PROJECT STATEMENT

Educational curricula are most effectively delivered by fostering curiosity through hands-on, real-world experience. Involving students and citizens in gathering and interpreting information at the Bell Museum Learning Landscape, this project will enliven water quality education. This project will support hands-on data collection, interpretation, and use by students and museum visitors (**Activity 1**), and citizen scientists (**Activity 2**) to build understanding of freshwater ecosystems, and empower students and adults with tools and knowledge to inform their decision-making around water resources. Data generated through this flexible, inquiry-driven, interactive approach will be integrated into the Bell Museum science labs and gallery programs, providing content for students and museum visitors, fostering an approach to science that is open to public participation and contributions. The new Bell Museum site offers an unprecedented environment to engage and educate Minnesotans on how freshwater ecosystems work, the benefits they provide, and how to protect them. Motivated by the curiosity and questions of visitors, and informed by ongoing research, this project will develop resources to enhance environmental education and create a model for connecting scientific inquiry to community concerns and interests in our water resources.

II. PROJECT ACTIVITIES AND OUTCOMES

Activity 1: Learning Landscape: Water Data for Environmental Education ENRTF BUDGET: $129,609

We will collect foundational data on water resources at the Bell Museum Learning Landscape (e.g., biodiversity, water quality, nutrient cycling, impacts of green infrastructure) to provide information to enrich and enliven environmental education curricula for classes and gallery programming. We will gather and curate data across a series of environments at the Learning Landscape, including a newly created wetland pond, shallow groundwater, and precipitation, stormwater runoff and infiltration systems. Visiting classes will use and add to this information through data they collect on site; we will work within lab programs at the Bell Museum to provide students with experiences in hands-on data collection and analysis at the Learning Landscape. The data collected will be integrated into museum science content and connected to Bell education themes, through videos of pond conditions, taxonomy samples, and interactive displays illustrating changes in water quality over time. These resources will provide a dynamic, and flexible resource for educators, students, and visitors to explore water resources in the Learning Landscape.

Outcome	**Completion Date**
1. Protocols and infrastructure to collect, interpret, and present water quality data at the Bell Museum Learning Landscape	*31 Dec 2019*
2. Program for students in Bell Museum lab programs (e.g., "Observations in Biodiversity" for 7-8th graders, and "Ecology and Populations Field Experience" for 9-12th graders) to collect and use data for water quality and aquatic life at and near the Learning Landscape	*31 Oct 2021*
3. Integrate water and aquatic life data collected by students and researchers into Bell Museum Learning Landscape and gallery programs	*30 June 2022*

Activity 2: Inquiry and citizen science for Living Ponds **ENRTF BUDGET: $150,075**

We will partner with local communities and the Bell Museum to identify questions people have about the water in their landscape, and work collaboratively with these communities to address them. We will meet with existing citizen groups and watershed districts, and poll visitors at the Bell Museum, to identify important lines of citizen inquiry about water and ponds. These questions will inform subsequent study design and data collection by UMN scientists and citizen volunteers at the Bell Museum pond and additional pond sites. Information about our community-based approach and science outcomes will be presented through Bell Museum content, online videos and special community events. Special events will pair academic and agency experts with communities around specific water issues, and provide two-way communication between researchers active in their field and citizens in a highly interactive format.

Outcomes	Completion Date
1. Establish ongoing, flexible Citizen Science Program for pond life based on citizen inquiry	*30 Mar 2020*
2. Citizen and UMN scientists complete phase one data collection for 15-20 local ponds	*31 Oct 2021*
3. Interactive dissemination of citizen-research on ponds and wetlands to local communities at the Bell Museum, libraries, special events, and web-based videos	*30 June 2022*

III. PROJECT PARTNERS:
A. Partners receiving ENRTF funding

Jacques Finlay, Professor, Ecology, Evolution & Behavior, U of MN - Project Director
Leonard Ferrington, Professor, Entomology, U of MN - Cooperating Investigator
Heather Cummins, Gallery Programs Coordinator, Bell Museum, U of MN - Cooperating Investigator
Daniel Larkin, Assistant Professor/Extension Specialist, Fisheries, Wildlife and Conservation Biology & Minnesota Aquatic Invasive Species Research Center, U of MN - Cooperating Investigator
Christine Dolph, Research Scientist, Ecology, Evolution & Behavior - Cooperating Investigator

B. Partners NOT receiving ENRTF funding

Capitol Region Watershed District (CRWD)

IV. LONG-TERM- IMPLEMENTATION AND FUNDING: This project directly addresses both 2019 LCCMR priority areas within *Environmental Education* and connects with *Water Resources* themes. Engaged citizens are essential for continued preservation of our state's water resources. This proposal will develop a model for integration of monitoring and research on Minnesota's freshwaters into educational programming and citizen science at a world class natural history museum. The tools and approaches developed will be adaptable for any group with information and interest in public education and engagement (e.g., DNR, MDH, MPCA, UMN -see water.umn.edu) so that new information and content can be affordably integrated into Museum programming in the future. To facilitate this, we will develop a framework and set of resources, to be hosted by the Bell Museum (www.bellmuseum.umn.edu/citizen-science/ for groups to use in expanding citizen-science partnerships.

V. TIMELINE REQUIREMENTS: The project will be completed in three years

2019 Proposal Budget Spreadsheet

Project Title: Enhancing Water Quality Education with Inquiry and Research

IV. TOTAL ENRTF REQUEST BUDGET 3 years

BUDGET ITEM	AMOUNT
Personnel:	
Jacques Finlay, PI (75% salary, 25% fringe benefits); 0.25 months per year for 3 years. To oversee and manage project, with contributions to all aspects of project including data collection and integration with the Bell Museum, and citizen science; 1 week salary each year during 2020-2022; 1 week salary	$ 12,173
Len Ferrington (75% salary, 25% fringe benefits); 0.25 months per year for 3 years. Contributions to all aspects of project including data collection and integration with the Bell Museum, and citizen science aspects; 1 week salary each year during 2020-2022	$ 12,458
Daniel Larkin (75% salary, 25% fringe benefits); 0.25 months per year for 3 years. Contributions to all aspects of project including data collection and integration with the Bell Museum, and citizen science aspects; 1 week salary each year during 2020-2022	$ 8,953
Heather Cummins, Research Associate (75% salary, 25% fringe benefits); 10% FTE for 3 years. Contributions to all aspects of project, including: to oversee integration of water data into Bell Museum Science Labs Observations in Biodiversity" for 7-8th graders, and "Ecology and Populations Field Experience" for 9-12th grade; work with all project peronnel to install equipment on Bell Museum Learning Landscape and at offsite locations; work with project personnel to develop outreach materials for citizen science programming at the Bell Museum (on Learning Landscape, in gallery spaces) and offsite.	$ 21,344
Christy Dolph, Research Associate (75% salary, 25% fringe benefits); 50% FTE for 3 years. To install and maintain sampling equipment in the field; contact and organize with local communities to identify science questions; recruit, train and coordinate for field sampling by citizen scientists; work with Bell Museum education staff to train students in hands-on data collection, aquatic species identification and data analysis; assist with sample collection in the field; process samples in the lab; analyze and synthesize data; create content for Bell Museum Gallery; organize community forums featuring presentations by local scientists.	$ 117,279
Undergraduate Research Assistants (100% salary, 0% fringe benefits); 13% FTE for 2 years. Hourly wages for part-time undergraduate research assistants who will help with sample collection and lab work. $12 per hour, 925 hours per year for two years.	$ 6,800
Junior Scientist (79% salary, 21% fringe benefits); 35% FTE for 2 years, responsible for lab analyses of water quality samples, undergraduate supervision, assistance with sample collection and data management.	$ 44,498
Professional/Technical/Service Contracts:	$ -
Equipment/Tools/Supplies: Non-capital equipment, sampling devices, measuring tools, consumables, reagents, containers, identification guides, office supplies, dataloggers and other materials need to perform field and laboratory sampling of aquatic plant and animal communities, water quality (nutrients, oxygen, temperature, chloride) and ecosystem processes.	$ 53,318
Acquisition (Fee Title or Permanent Easements):	$ -
Travel: Funds for travel to field sites and meetings with stakeholders and collaborators. Funds for presentation at the annual Water Resources Conference.	$ 2,861
Additional Budget Items:	$ -
TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND $ REQUEST =	$ 279,684

V. OTHER FUNDS *(This entire section must be filled out. Do not delete rows. Indicate "N/A" if row is not applicable.)*

SOURCE OF FUNDS	AMOUNT	Status
Other Non-State $ To Be Applied To Project During Project Period:	$ -	
Other State $ To Be Applied To Project During Project Period:	$ -	
In-kind Services To Be Applied To Project During Project Period: Indirect costs (33% MTDC) associated with this proposal	$ 92,295	*Secured*
Past and Current ENRTF Appropriation:	$ -	
Other Funding History:	$ -	

Enhancing Water Quality Education with Inquiry and Research

In Activity 1, Freshwater researchers, educators, and the Bell Museum come together to offer engaging programming centered on water quality and aquatic ecosystems of the new Learning Landscape

UNIVERSITY OF MINNESOTA
Driven to Discover®

bell museum

In Activity 2, partnerships with citizens and cities are developed for broader public engagement around freshwater ecosystems using inquiry-driven citizen science projects that connect with activity 1

Project Manager Qualifications and Organization Description

Jacques Finlay, Professor, Ecology, Evolution and Behavior, University of Minnesota.
B.S., Natural Resources, 1990. University of New Hampshire, Durham, NH.
Ph.D., Integrative Biology, 2000. University of California, Berkeley, CA.

Jacques Finlay will be responsible for project coordination, mentoring the junior scientists associated with the project, and coordination of all activities with the Bell Museum, PI's, educators and citizen scientists. Throughout his career, Dr. Finlay has studied how watersheds and watershed management influence aquatic ecosystems. His recent work is focused on water quality improvement via improved understanding and management of pollutant sources in urban and rural ecosystems. He has mentored 15 graduate students and 13 post-doctoral fellows in his career. In the proposed project, he and co investigators are committed to connecting research to environmental education via unique partnership with students, educators, citizens and scientists at the Bell Museum of Natural History in Saint Paul.

Representative publications

Hansen, A.T., C. Dolph, E.P. Foufoula-Georgiou, and J.C. Finlay. 2018. ***Contribution of wetlands to nitrate removal at the watershed scale.*** *Nature Geoscience 11(2): 127-132*

Hobbie, S.E., J.C. Finlay, D. Millet, B.D. Janke, L.A. Baker, and D. Nidzgorski. 2017. ***Contrasting nitrogen and phosphorus budgets in urban watersheds and implications for managing urban water pollution****. Proceedings of the National Academy of Sciences 114(16): 4177–4182*

Finlay, J.C., G.E. Small, and R.W. Sterner. 2013. ***Human influences on nitrogen removal in lakes****. Science.342 (6155),247-250. DOI:10.1126/science.1242575.*

Keeler, B.L., S. Polasky, K.A. Brauman, K.A. Johnson, J.C. Finlay, A. O'Neill, K. Kovacs, and B. Dalzell. 2012. ***Linking water quality and well-being for improved assessment and valuation of ecosystem services.*** *Proceedings of the National Academy of Sciences 109(45): 18619-18624*

Organization Description

The University of Minnesota is one of the largest, most comprehensive, and prestigious public universities in the United States (http://www1.umn.edu/twincities/01_about.php). The mission of the Bell Museum of Natural History is to ignite curiosity and wonder, explore our connections to nature and the universe, and create a better future for our evolving world. For over 140 years, the Bell Museum has collected, preserved, interpreted, and displayed the natural history of Minnesota as the state's official natural history museum. The Bell Museum has a long-standing commitment to making natural history more accessible to diverse public audiences through on- and off-site programs, particularly for K–12 students and community audiences through pop-up museums. As the museum prepares to open a new museum building in summer 2018, its role is expanding to become the gateway to the sciences at the University of Minnesota. The Bell Museum and the labs and offices of the investigators and collaborators are equipped with the necessary space and facilities needed for the proposed activities.