

**Environment and Natural Resources Trust Fund  
2016 Request for Proposals (RFP)**

---

**Project Title:**

**ENRTF ID: 113-C**

Pilot/Bench-Scale Wetlands to Mitigate Potential Aqueous Contaminants

---

**Category:** C. Environmental Education

---

**Total Project Budget:** \$ 37,250

**Proposed Project Time Period for the Funding Requested:** 3 years, July 2016 to June 2019

**Summary:**

CWTSs for passive water treatment can mitigate contaminants in industrial influenced waters. Students will increase application of the scientific process using CWTSs for supplemental research projects within critical resource-management degrees.

---

**Name:** ONiell Tedrow

**Sponsoring Organization:** Vermilion Community College

**Address:** 1900 East Camp Street  
Ely MN 55731

**Telephone Number:** (706) 224-1589

**Email** oniellt@gmail.com

**Web Address** www.vcc.edu

---

**Location**

**Region:** NE

**County Name:** St. Louis

**City / Township:** Ely

---

**Alternate Text for Visual:**

Presented here = working example of pilot-scale CWTS at Clemson University.

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



**Environment and Natural Resources Trust Fund (ENRTF)**

**2016 Main Proposal**

**Project Title:** Pilot/Bench-Scale Wetlands to Mitigate Potential Aqueous Contaminants

**PROJECT TITLE:** Pilot/Bench-Scale Wetlands to Mitigate Potential Aqueous Contaminants

**I. PROJECT STATEMENT**

This **Environmental Education Environment and Natural Resources Trust Fund (ENRTF) proposal** will develop and use bench- and pilot- scale constructed wetland treatment systems (CWTS) to mitigate potential contaminants in surface waters influenced by industrial activity (ex.: mining, storm water, wastewater treatment plant effluent). Concurrent with these CWTS, seed germination and plant development studies may be completed in an effort to test influences from potential contaminants from industry-influenced waters. This will offer students at Vermilion Community College (VCC) the exceptional opportunity to obtain relevant research-project experience which may exceed that of advanced-degree granting Universities.

Current industrial advances have increased the need for additional raw materials; specifically, copper, nickel, zinc, gold, and platinum used in modern electronic products. In many areas, extraction of these elements associated with sulfide bearing ore (SBO) bodies has resulted in contamination and impairment of localized subsistence and recreational use of critical water resources. Sources of these elements are located in SBO bodies beneath thousands of feet of overburden within sensitive ecosystems such as Lake Superior watershed, Wild Rice waters, and the Boundary Waters Canoe Area Wilderness. The potential for impairment of these water resources is sufficiently high that proposed SBO mining operations in these areas have been extensively scrutinized. Viable options for passive mitigation of potential aqueous contaminants from proposed mining operations are preferred over cost-intensive active (water) treatment options. Due to the needs of industry in terms of well-educated and creative employees, the **urgency** and **extent of impacts** of this type of research facility at a locally-critical Community College cannot be overstated.

The **Overall Goals** of this current **Environmental Education** project are to develop and use bench- and pilot-scale CWTS to educate students about the potential for using passive treatment options for removal of certain constituents of concern in synthesized natural waters. Experiments designed to measure responses of plant life stages to exposures of synthesized water containing potential contaminants of concern may also be completed in an effort to educate students about more critical life stages of specific plants. **Outcomes** from these experiments will be to: **1)** augment existing **Water Resource Educational Programs** and Degrees at VCC; **2)** educate students about specific plants; **3)** educate students on use of passive water treatment systems; **4)** educate students on chemical reactions in CWTS; and **5)** educate students on exposure / response relationships specific to plant life stages. Once the greenhouse is set-up, all student experiments and research projects will **directly support, advance, and integrate environmental education** into multiple, current VCC academic curricula.

**II. PROJECT ACTIVITIES AND OUTCOMES**

**Activity 1: Initial Experimental Area (Greenhouse) Set-up by Non-Paid Project** **Budget: --**

**Personnel**

Immediately following execution of this **Environmental Education** proposal / grant, site preparation for greenhouse installation will begin. Due to design characteristics of the greenhouse, site preparation will not require water / sewer connections. Stated completion dates are conservative estimates; every possible effort will be made to achieve these completion dates.

<b>Outcome</b>	<b>Completion Date</b>
1. Prepare site for greenhouse set-up.	August 2016
2. Assemble greenhouse structure.	August – September 2016
3. Set-up CWTS area.	September – October 2016

**Activity 2: Initiation of Experimental CWTS and Seed / Plant Areas and Structures** **Budget: \$37,250**

All necessary components for CWTS initiation, and seed and plant experimentation, will be purchased immediately following grant execution. This will also involve set-up, and testing and initiation of all equipment.



**Environment and Natural Resources Trust Fund (ENRTF)**

**2016 Main Proposal**

**Project Title:** Pilot/Bench-Scale Wetlands to Mitigate Potential Aqueous Contaminants

Funds allocated within this ‘activity’ (miscellaneous \$10,000.00) also include those appropriated for various instrument / meter maintenance needs.

<b>Outcome</b>	<b>Completion Date</b>
<i>1. Order all experimental set-up supplies and equipment.</i>	<i>October – November 2016</i>
<i>2. Set-up and test all supplies and experimental equipment.</i>	<i>November – December 2016</i>
<i>3. Begin testing set-up; measuring constituents of interest and field measurements of pH, temperature, dissolved oxygen, and conductivity.</i>	<i>November – December 2016</i>

**III. PROJECT STRATEGY**

**A. Project Team / Partners**

This particular **Environmental Education** project is designed to be more of a one-time cost scenario, with periodic maintenance expenses based on the desired student projects. Miscellaneous funds listed in the project budget will be used to purchase long-term-use / non-perishable supplies and equipment; funds remaining in this category are intended to be used for manufacturer instrument-maintenance needs. All personnel associated with this project are anticipated to be full-time State employed and will not receive payment for work on this project.

**Project Team / Partners Not Receiving Funds from Project**

- O’Niell Tedrow, M.S., VCC Biology Instructor. Provide technical guidance for experimental area set-up; CWTS construction, formulation, and temporal system maintenance.
- Wade Klingsporn, VCC Water Resources Instructor. Additional guidance for experimental system set-up; **technical guidance for augmentation of existing Water Resource academic curricula.**
- Dave Marshall, VCC Facilities Manager. Manage site preparation, overall installation of greenhouse.
- Greg Mackie, VCC Facilities Engineer / Project Construction Manager. Manage construction of greenhouse.
- Jim Bolte, Mike Gauthier, and Lenny Raati, VCC Construction Technicians. Construction of greenhouse experimental area.

**B. Project Impact and Long-Term Strategy**

The **Long term Strategy** for this project is to provide an area conducive to research relevant to current-event topics in the field of **Water Resource Management, Natural Resource Management, and Environmental Awareness** in terms of how specific plants response to specific of exposures. In keeping with the **VCC Mission Statement**, use of this greenhouse research area will **increase students’ preparedness to work, live, and learn in the changing world around us, especially the natural world that surrounds us.** Currently, no additional funds for future projects are being sought. The \$10,000.00 in the current proposed budget is intended for peripheral needs; i.e., instrument / meter manufacturer maintenance needs. The long-term plan for this facility is to be self-sustaining with minimal investment in terms of routine maintenance. Future ENTRF funding may be sought for specific research projects which may be completed using this facility.

**C. Timeline Requirements**

Timeline requirements for this proposed project are more funding-dependent. The approximate one (1) year lead-time until grant execution will allow for appropriate planning for greenhouse site selection. Ideally, the greenhouse structure will be obtained and constructed during Fall 2016. This will allow adequate time for purchase of supplies and equipment specific to research project development. This particular **Environmental Education** project is intended to result in many years of student use and **integrated class and Program / degree** use. Since VCC currently has **Water Resource** and **Natural Resource Technology** academic programs, this project will be used by multiple VCC faculty, for multiple class / course projects, for multiple years.

## 2016 Detailed Project Budget

**Project Title:** Pilot/Bench-Scale Wetlands to Mitigate Potential Aqueous Contaminants

**IV. TOTAL ENRTF REQUEST BUDGET \$37,250.00** for project set-up, initiation, and some follow-up instrument maintenance needs over the course of approximately 3 years.

<u>BUDGET ITEM</u>	<u>AMOUNT</u>
<b>Personnel:</b> O'Niell Tedrow, MS, Project Manager (non-paid position). Already full-time State employed.	\$ -
<b>Personnel:</b> Wade Klingsporn, Project Co-Manager (non-paid position). Already full-time State employed.	\$ -
<b>Personnel:</b> Facilities and Construction Managers. Already full-time State employed.	\$ -
<b>Personnel:</b> Construction Technicians. Already full-time State employed.	\$ -
<b>Personnel:</b> Clerical needs in terms of budget tracking and management of Grant paperwork. Already full-time State employed.	\$ -
<b>Equipment/Tools/Supplies:</b>	
Field Meter: YSI Pro Plus with Quad Cable - x1; approx. \$2000.00 each with possible accessories.	\$ 2,500
YSI Pro Plus Calibration Standards - pH 4.0, 7.0, 10.0, and conductivity standards for instrument calibration.	\$ 1,200
Rubbermaid Commercial 100 gallon Tanks - x18 for CWTSs 'cells.'	\$ 1,800
Greenhouse with Propane Heater - x1 to better maintain temperature.	\$ 12,000
QG50 FMI Pump - x2; to regulate CWTS inflow rate.	\$ 2,400
Q1CKC FMI Pump Head - x2; attach to FMI pump (above).	\$ 1,200
FMI Tubing and Pump Supplies - supplies for two FMI pumps (above).	\$ 500
Hach DR900 Handheld Spectrophotometer - x1; measure constituents of interest (Cu, Fe, sulfate, and dozens of other potential COCs)	\$ 1,400
Hach DR900 Supplies - purchase only those reagents needed for COCs.	\$ 2,000
Centrifuge Tubes for Water Samples - as needed for removing particles from CWTS water samples.	\$ 500
Centrifuge - x1; for removing particles from CWTS water samples.	\$ 1,000
Greenhouse Shelving - x 4-6; for seed germination and other plant studies.	\$ 750
<b>Acquisition (Fee Title or Permanent Easements):</b>	
<b>Travel:</b>	NA
<b>Additional Budget Items:</b> We anticipate using these funds for instrument repair and calibration needs (new sensors, cleaning needs, cable, batteries, add'l. Hach DR900 supplies).	\$ 10,000
<b>TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND \$ REQUEST =</b>	<b>\$ 37,250</b>

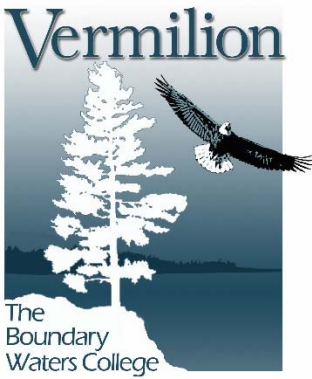
### V. OTHER FUNDS

<u>SOURCE OF FUNDS</u>	<u>AMOUNT</u>	<u>Status</u>
<b>Other Non-State \$ To Be Applied To Project During Project Period:</b> Other than some funds from VCC Programs (i.e., Water Resources and Natural Resource Technology Degree Programs) in the form of purchasing some consumable supplies, no other non-State sources of funding are expected in support of this proposed project.	NA	NA
<b>Other State \$ To Be Applied To Project During Project Period:</b> Other than some funds from VCC Programs (i.e., Water Resources and Natural Resource Technology Degree Programs) in the form of purchasing some consumable supplies, no additional State sources of funding are expected in support of this proposed project.	NA	NA
<b>In-kind Services To Be Applied To Project During Project Period:</b> Other than some funds from VCC Programs (i.e., Water Resources and Natural Resource Technology Degree Programs) in the form of purchasing some consumable supplies, no in-kind sources of funding are expected in support of this proposed project.	NA	NA
<b>Funding History:</b> New, innovative and unique project proposal, which will provide an extraordinary series of opportunities for Community College students supplementing and complimenting their VCC education in Water Resources and / or Natural Resource Technology.	NA	
<b>Remaining \$ From Current ENRTF Appropriation:</b> No past ENRTF funds have been applied-for or received; therefore, no funds from any other ENRTF projects will be used in support of the current proposal.	NA	NA



**Image 1.** Pilot-scale constructed wetland treatment system (CWTS) using ~ 100-gallon Rubbermaid® troughs as 'cells.' Objective of this system (above): mitigate constituents of concern in flue-gas desulfurization (FGD) waters using a CWTS.

This is the basic design of the proposed VCC CWTS system; the VCC system will use a (likely) maximum of four cells per series based on the size of the proposed greenhouse.



Vermilion Community College  
1900 East Camp Street  
Ely, MN 55731

P: 218-365-7200  
P: 800-657-3608  
Fax: 218-235-2173  
[www.vcc.edu](http://www.vcc.edu)

#### VCC Mission

'Vermilion Community College educates people from all walks of life to become well-rounded, ethical citizens prepared to work, live, and learn in a changing world especially the natural world that surrounds us.'

**RE:** 2016 LCCMR Project Manager Qualifications and Organization Description

**Project Title:** Pilot/Bench-Scale Wetlands to Mitigate Potential Aqueous Contaminants

Dear Project Proposal Selection Committee;

The Vision and Mission, concurrent with academic Programs, of Vermilion Community College (VCC) directly align with Environment and Natural Resources Trust Fund (ENRTF) goals and funding priorities. VCC prides itself on providing Degree and Certification programs focused on **Water Resources** and **Natural Resource Technology / Management**, specifically those resources vital to Minnesota. VCC is also located in the direct vicinity of current and proposed mining industry activity; some of which includes controversial sulfide bearing ore mining proposals. VCC provides critical **Water Resource** education in the form of **Water / Wastewater Management Degrees**, and prepares students to obtain employment in wastewater management, or continue their studies of **Water / Natural Resource Management** at advanced-degree granting Universities. As a Community College in such a critical industrial area, VCC has an obligation to provide current and relevant academic experiences to students. This proposed research project will enhance and supplement existing **Water / Natural Resource** programs.

The Project Manager (O'Niell Tedrow) has approximately 14 years of academic, government, and private industry experience with research project design, management, completion, and reporting. O'Niell initiated his research at St. Cloud State University measuring responses of algal taxa to exposures of ibuprofen, acetaminophen, estradiol, and alkylphenols. He continued his toxicology studies at Clemson University, managing large-scale industry funded toxicology studies measuring responses of algae to algacide exposures; and responses of amphibian taxa to pesticide exposures. During two years as a research assistant at the Athens, GA, USEPA NERL facility, he studied photo-transformation of carbon nanoparticles; followed by approximately four years as a water resources scientist working with NTS, a consulting firm in Virginia, MN. As a VCC Biology Instructor he currently manages one MPCA SWAG and one WPLMN Grant (both student-experience focused); shares knowledge of critical water resource management with students in several academic programs; and maintains a close association with NTS / local industry as a source of student internship / employment opportunities. He is an author on multiple peer-reviewed publications and contributions on his research foci; and is currently pursuing his Ph. D. in Biotechnology through Lakehead University.

Ultimately, development of the **proposed CWTS project** at VCC will enhance and advance students' knowledge, use, and understanding of the scientific process while supplementing already exceptional **Water / Natural Resource** focused academic programs. This proposed project will be used by multiple students and faculty, for multiple academic programs, over many years, resulting in project and research experiences at the Community College level more typical of advanced-degree granting Universities.

Please contact O'Niell Tedrow with any comments or questions.

O'Niell Tedrow, MS  
VCC Biology instructor // Water Resources Scientist  
Cell: 706.224.1589 Email: [oniellt@gmail.com](mailto:oniellt@gmail.com)

VERMILION COMMUNITY COLLEGE

A Member of the MnSCU System. An Affirmative Action Equal Opportunity Educator / Employer.