

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

---

**Project Title:**

**ENRTF ID: 128-C**

Farm Based Environmental Education: Studies Measuring Altered Hydrology

---

**Category:** C. Environmental Education

---

**Total Project Budget:** \$ 206,199

**Proposed Project Time Period for the Funding Requested:** 3 years, July 2018 to June 2021

**Summary:**

Create educational opportunities for emerging environmental scientists by providing living laboratories with numerous practices/structures/systems at one site demonstrating how to manage and measure altered hydrology on a working farm.

---

**Name:** Alan Kraus

**Sponsoring Organization:** Cannon River Watershed Partnership

**Address:** 400 Washington Street  
Northfield MN 55057

**Telephone Number:** (507) 786-3913

**Email** alan@crwp.net

**Web Address** www.crwp.net

---

**Location**

**Region:** Southeast

**County Name:** Dakota, Goodhue, Le Sueur, Rice, Steele, Waseca

**City / Township:** Northfield/Greenvale

---

**Alternate Text for Visual:**

The map is an aerial view of the David Legvold Farm near Northfield, MN. An open agricultural field is shown with Mud Creek on the north end of the property. An indicator shows that buffer practices will take place along Mud Creek.

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



**PROJECT TITLE: Farm Based Environmental Education: Studies Measuring Altered Hydrology**

**I. PROJECT STATEMENT**

The goal of this project is to create educational opportunities in managing and measuring altered hydrology for emerging environmental scientists, farmers and land owners in Southeastern Minnesota by providing farm based living laboratories that combine numerous practices/structures/systems on a working farm.

Riverine hydrology has been altered via the increasing intensity of rainstorms, total annual precipitation, infrastructure improvements, urban and rural sprawl, and transportation needs. It has also been altered by the type and selection of agricultural cropping systems, primary tillage, surface and subsurface drainage. There's little agreement regarding the impact agricultural drainage has on altered hydrology. However the range of potential solutions to reduce runoff volume are numerous. Complicating the matter is the fact that few, if any, working agricultural production settings are in place to help educate students interested in testing practices affecting altered hydrology

In this proposed project, Cannon River Watershed Partnership's collaboration with area colleges, governmental agencies, private enterprises, and landowners David and Ruth Legvold will create college student capstone educational opportunities that examine the management and comparisons of ten conservation practices. These practices will be implemented within a corn-soybean rotation and into an existing vegetative buffer along Mud Creek, a tributary to the Cannon River.

The outcomes are: 1) improved senior capstone projects for Environmental Studies students enrolled at St. Olaf College and Carleton College; 2) stabilized near channel and in-channel features that have been created by altered hydrology; 3) improved water quality and reduced risks to downstream landowners; and 4) a farm based environmental educational site for students to better prepare them to work with farmers and landowners to address altered hydrology in agricultural landscapes throughout Minnesota.

**II. PROJECT ACTIVITIES AND OUTCOMES**

**Activity 1: Create farm based environmental educational opportunities for college students.** The goal is to provide a working farm site for students to gain knowledge and experience testing numerous structures/practices/systems affecting altered hydrology. The tasks will be to design research projects to test hypotheses related to altered hydrology. The evaluation of this activity will be the number, quality and scientific concurrence of capstone papers, research projects and presentations. Each of the outcomes listed below will prepare students to work professionally in environmental science careers, agriculture or a related field.

**Budget: \$62,256**

Outcome	Completion Date
1. Capstone papers, research projects and presentations related to buffers and edge of field practices.	2019, 2020, 2021
2. Capstone papers, research projects and presentations related to in-field cropping and conservation tillage practices.	2019, 2020, 2021
3. Outreach and educational presentations to farmers and landowners.	2019, 2020, 2021



**Activity 2: Create farm based infrastructure to provide educational opportunities related to altered hydrology.**

**Budget: \$83,699**

The goal is to provide a working farm site where students can gain knowledge and experience testing numerous structures/practices/systems affecting altered hydrology. The task will be to design and implement near channel buffers and edge of field systems to compare four vegetative buffer species and a comparison of a saturated buffer and a wood-chip bioreactor. The four near stream buffers will be variations of woody species, native grasses, native fruit and nut bearing trees, and native big woods buffers. Rainfall surface runoff and infiltration along with biomass growth rates and carbon sequestration will be compared across these four practices. Wildlife activity will be evaluated to differentiate songbird and migratory wildfowl attracted to each practice. Cross sectional area measurements will be used to compare movement of the stream corridor.

A saturated buffer, where tile water is redirected into the soil, the organic matter and the plant roots beneath the vegetative buffer, will be compared to a woodchip bioreactor to determine the efficacy for treatment of nutrients, fecal coliform and E.coli bacteria, listed impairments in Mud Creek and the Cannon River. A dewatering line in the saturated buffer between the treatment zone and the stream bank will be installed to allow for sampling. The woodchip bioreactor will include native trees to measure woody species survivability, growth rates, and carbon sequestration. Other measurements into and out of the bioreactor will include flow rates/bypass, nitrates, phosphorus and organic carbon.

The evaluation will be the resulting sampling and data collection opportunities as well as the measurable comparisons between the treatments and controls. Each of the outcomes listed below will provide science based rationale for testing hypotheses that support potential recommended practices for buffer design and the impact on altered hydrology.

Outcome	Completion Date
1. Nutrient concentration and flow comparisons of tile drainage water between buffer species, saturated buffer and bioreactor.	2019, 2020, 2021
2. Carbon sequestration comparisons between buffer species, saturated buffer and bioreactor.	2019, 2020, 2021
3. Streambank stability comparisons between buffer species.	2019, 2020, 2021

**Activity 3: Create farm based crop plans to provide educational opportunities related to altered hydrology.**

**Budget: \$60,244**

The goal is to provide a working farm site where students can gain knowledge and experience testing numerous structures/practices/systems affecting altered hydrology. The task is to design and implement in-field replications of cover crops and conservation tillage practices. Cover crops help to manage the movement of water and minimize the damage from intense rainfall events by protecting the soil



surface, increasing infiltration rates and improving water holding capacity that, in total, creates a more resilient system. The evaluation will be the resulting sampling and data collection opportunities as well as the measurable comparisons between the treatments and controls. Nutrient concentrations in tile drainage lines from fields with cover crops will be compared to controls. Water loss from the acreage will be also managed with tile drainage flow gates and nutrient concentrations will be compared to drainage tile water without flow gates. Soil organic matter and water holding capacity of fields seeded with cover crops will be compared to controls. Soil tests taken from cover crop seeded fields and reference fields at the start of the project will be compared to tests taken at the end of the 3 year project. Each of the outcomes listed below will provide science based rational for testing hypotheses that support potential recommended practices for planting cover crops and conservation tillage and the impact on altered hydrology.

<b>Outcome</b>	<b>Completion Date</b>
1. Nutrient concentration and flow comparisons of tile drainage water at field drain tiles between cover crop replications and controls.	2020, 2021
2. Carbon sequestration comparisons between cover crop replications and controls.	2020, 2021
3. Yield comparisons of target cash crop between cover crop replications and controls.	2020, 2021
4. Water holding capacity and organic matter comparisons between cover crop replications and controls.	2020, 2021

**III. PROJECT STRATEGY**

**A. Project Team/Partners**

In this proposed project, Cannon River Watershed Partnership will collaborate with St. Olaf College, Carleton College, Minnesota Department of Agriculture, Dakota County SWCD, Ellingson Drainage Companies and farm owners, David and Ruth Legvold to design college senior capstone educational opportunities that examine the management and comparisons of ten conservation practices implemented within a corn-soybean rotation and also within a buffer zone along Mud Creek, a tributary to the Cannon River.

The project manager is Alan Kraus, Conservation Program Manager for the Cannon River Watershed Partnership (CRWP). Alan earned a B.S. in Dairy Science and M.S. in Agricultural Economics from the University of Wisconsin - Madison. He has 25 years of experience dairy farming in Central Wisconsin. As a member of the Marathon County Board of Supervisors, Alan Chaired the Environmental Resources Committee and was Vice Chair of the Land Conservation and Zoning Committee. He is also a past University of Wisconsin – Extension Dairy and Livestock Agent. Alan will provide project guidance, management, reporting, and educational outreach. He will also help design the in-field cover crop and tillage practices.

Cannon River Watershed Partnership – Executive Director will provide leadership and support for educational outreach and project management.

Minnesota Department of Agriculture - Mark Dittrich, Senior Planner Conservation Drainage, will provide technical support for all drainage and buffer structures design and management. Mark will also provide support for educational outreach and student mentoring.

St. Olaf College - Dr. Kathleen Shea, Professor of Biology, will work directly with capstone students assisting them in the specific thesis design and hypothesis testing.



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

### **2018 Main Proposal**

#### **Project Title: Farm Based Environmental Education: Studies Measuring Altered Hydrology**

Carleton College - Dr. Mary Savina, Professor of Geology, will work directly with capstone students assisting them in the specific thesis design and hypothesis testing.

Dakota County SWCD - Brian Watson, District Manager, will provide technical staff support for buffer design and management.

Ellingson Companies - Mike Tveten, Project Manager, will provide drainage structure services and support.

David Legvold - Farm Owner/Operator – will provide the farm landscape, on farm agricultural practices, daily management of drainage structures, and support for educational outreach and student mentoring.

The Cannon River Watershed Partnership, a well-respected, member-based, 501 (c) (3) nonprofit organization that began in 1990, envisions a healthy watershed with clean water that is fishable, swimmable and drinkable. Its mission is to engage people in protecting and improving the water quality and natural systems of the Cannon River watershed. CRWP partners with county planning and zoning offices, soil and water conservation districts, cities, state agencies, academia, citizen groups and land owners in order to create long term watershed improvement. CRWP is governed by a 25 member Board of Directors. Twelve are elected officials – six county commissioners and six Soil and Water Conservation District Supervisors from the six counties of the watershed. Thirteen are citizen members who are elected by our membership.

David Legvold has a long history of collaborating on water quality and soil conservation efforts with organizations that include the Minnesota Department of Agriculture, the Minnesota Pollution Control Agency, St. Olaf College, Carleton College and the University of Minnesota. CRWP hosted Governor Dayton's Minnesota Buffer Initiative at Mr. Legvold's farm in 2015.

CRWP, St. Olaf College, Carleton College and David Legvold will receive funds from this grant and will also provide in-kind contributions to the project. Minnesota Department of Agriculture, Dakota County SWCD and Ellingson Drainage Companies will provide in-kind contributions to this project.

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

In the long term this project will result in professionals trained in environmental sciences with practical applications for production agriculture and edge of field treatments. With this knowledge and expertise, they may wish to continue in this field of study to better assist landowners or use this experience in other ways. This project will also result in an established farm based environmental laboratory for continued education, training and outreach. In addition, this project's data will improve the viability of the potential for woody and food production within buffers and support recommendations related to cover crops and conservation tillage.

#### **C. Timeline Requirements**

The proposed timeline for this project is 3 years. Although plans for continued educational programming have not been established at this time, future educational opportunities exist.

## 2018 Detailed Project Budget

**Project Title: Farm Based Environmental Education: Studies Measuring Altered Hydrology**

### IV. TOTAL ENRTF REQUEST BUDGET \$206,199 years 3

BUDGET ITEM	AMOUNT
<b>Personnel:</b> Cannon River Watershed Partnership - project guidance, coordination, reporting, grant management, educational outreach, in-field practices planning. 100% for salary. Conservation Program Manager and Executive Director. (2 people)	\$ 50,625
<b>Professional/Technical/Service Contracts:</b> David Legvold - Farm site owner - farm cropping practices, mentoring, educational outreach, crop planning , daily crop and buffer management.	\$ 32,400
<b>Professional/Technical/Service Contracts:</b> Students - water and soil sample collection, data analysis, capstone presentations, educational outreach. (5 people)	\$ 37,000
<b>Equipment/Tools/Supplies:</b> Four vegetated buffers - materials and establishment.	\$ 8,050
<b>Equipment/Tools/Supplies:</b> Bio-reactor - materials and establishment.	\$ 21,100
<b>Equipment/Tools/Supplies:</b> Drainage water management - materials and establishment	\$ 7,150
<b>Equipment/Tools/Supplies:</b> Sampling supplies and testing	\$ 33,267
<b>Equipment/Tools/Supplies:</b> Saturated buffer - materials and establishment.	\$ 14,132
<b>Travel:</b> CRWP - Attend and present at regional agency and farm producer group events.	\$ 2,475
<b>TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND \$ REQUEST =</b>	<b>\$ 206,199</b>

### V. OTHER FUNDS

SOURCE OF FUNDS	AMOUNT	Status
<b>Other Non-State \$ To Be Applied To Project During Project Period:</b> <i>Indicate any additional non-state cash dollars secured or applied for to be spent on the project during the funding period. For each individual sum, list out the source of the funds, the amount, and indicate whether the funds are secured or pending approval.</i>	N/A	N/A
<b>Other State \$ To Be Applied To Project During Project Period:</b> <i>Indicate any additional state cash dollars (e.g., bonding, other grants) secured or applied for to be spent on the project during the funding period. For each individual sum, list out the source of the funds, the amount, and indicate whether the funds are secured or pending approval.</i>	N/A	N/A
<b>In-kind Services To Be Applied To Project During Project Period:</b> The Colleges - St. Olaf College, Carleton - Professorial Guidance on student projects, analysis, education and outreach. Students - sampling, analysis, capstone presentation; Minnesota Department of Agriculture - Professional technical service; Cannon River Watershed Partnership - grant management, reporting; David Legvold - Farm management, site access; Dakota County SWCD - Professional Technical services; Ellingson Drainage Companies - Professional Technical services.	\$ 131,600	Secured \$123,900; Pending \$7,700
<b>Past and Current ENRTF Appropriation:</b> <i>Specify dollar amount and year of appropriation from any current ENRTF appropriation for any directly related project of the project manager or organization that remains unspent or not yet legally obligated at the time of proposal submission. Be as specific as possible. Indicate the status of the funds.</i>	N/A	N/A
<b>Other Funding History:</b> <i>Indicate funding secured but to be expended prior to July 1, 2018, for activities directly relevant to this specific funding request. State specific source(s) of funds and dollar amount.</i>	N/A	N/A



Eveleth Ave

Demo Site

© 2016 Google

07/29/2017

Google earth

ENRTF ID: 128-C

## Project Manager and Organization Qualifications

Alan Kraus, Conservation Program Manager for the Cannon River Watershed Partnership, earned a B.S. in Dairy Science and M.S. in Agricultural Economics from the University of Wisconsin - Madison. He has 25 years of experience dairy farming in Central Wisconsin where he implemented managed grazing and pasture improvement as well as no-till planting of corn and soybeans. As a member of the Marathon County Board of Supervisors, Alan was Vice Chair of the Land Conservation and Zoning Committee for 13 years and Chair of the Environmental Resources Committee. He is also a past University of Wisconsin – Extension Dairy and Livestock Agent.

Other collaborating organizations and staff:

Kristi Pursell, Interim Executive Director, Cannon River Watershed Partnership

Minnesota Department of Agriculture - Mark Dittrich, Senior Planner Conservation Drainage

St.Olaf College - Dr. Kathleen Shea, Professor of Biology

Carleton College - Dr. Mary Savina, Professor of Geology

Dakota County SWCD - Brian Watson, District Manager

Ellingson Companies - Mike Tveten, Project Manager

David Legvold - Farm Owner/Operator

Cannon River Watershed Partnership (CRWP), a well-respected, member-based, 501 (c) (3) nonprofit organization that began in 1990, envisions a healthy watershed with clean water that is fishable, swimmable and drinkable. Its mission is to engage people in protecting and improving the water quality and natural systems of the Cannon River watershed. CRWP partners with county planning and zoning offices, soil and water conservation districts, cities, state agencies, academia, citizen groups and land owners in order to create long term watershed improvement. CRWP is governed by a 25 member Board of Directors. Twelve are elected officials (or their designated representative) – six county commissioners and six Soil and Water Conservation District Supervisors from the six counties of the watershed. Thirteen are citizen members who are elected by our membership.