Presidential Faculty/Student Collaboration and Publication Grant
Deadline Monday, February 22, 2016

Please use this checklist and budget. Include with your completed application. For more information about Presidential Faculty/Student Collaboration and Publication grants, please see https://gustavus.edu/kendallcenter/grant-opportunities/presidential-grant.php.

FACULTY INFORMATION

Name: Laura Triplett — Email: ltriplet@gustavus.edu

Department: Geology, and Environmental Studies Program — Rank: Associate Professor

STUDENT INFORMATION

Name: Connor Smith — Email: csmith10@gustavus.edu

Major(s): Geology — Graduation Year: 2017

CHECKLIST

Project Details

- x Brief description of the proposed project including its collaborative nature
- x Clear statement of anticipated outcomes
- x Likely placement for publication or performances
- x Anticipated research completion date

Participant Details

- x Names and brief biographies of all participants
- x Explanation of how this project fits into the career of the faculty member
  Note: Applications from faculty at all career stages are encouraged
- x Explanation of how this project fits into the educational trajectory of the student
  Note: Statement should be written by the student; include year of graduation; student eligibility is limited to full-time returning students

- x **Presidential Budget Proposal Form**

- x If successful, my proposal can be used as an example to assist future applications. Check to give permission. This decision will not influence the application evaluation.

Submit electronically as a PDF to cblaukat@gustavus.edu at the John S. Kendall Center for Engaged Learning.

Presidential Faculty/Student Collaboration Grant

Budget Information

Faculty Stipend ($300 per week, up to $3,000 for a maximum of 10 weeks)
Student Summer Stipend ($400 per week, up to $4,000 for a maximum of 10 weeks)
Student Summer Campus Housing ($60 per week, for a maximum of 10 weeks)
Budget Maximum ($8,100 for all categories)

Item		**Amount**
Equipment (e.g., transcription machine, camera, cassette recorder – but not to include computer hardware)		**$ 0**
1:	Cost:	
2:	Cost:	
3:	Cost:	
Materials (e.g., books, printing, software, lab supplies)		**$1176**
1: I.C. column and parts (lab)	Cost: $1000	1000
2: Misc. lab supplies	Cost: $276	176
3:	Cost:	
Travel Costs (cannot include conference travel, see http://gustavus.edu/finance/travel.php for allowable travel expenses)		**$ 224**
Airfare:		0
Mileage: Number of miles 400 @ $0.56/mile		224
Lodging:		0
Meals:		0
Stipends & Housing		**$6700**
Faculty Stipend	$300 per week, up to $3,000 for a maximum of 10 weeks	$2100
Student Summer Stipend	$400 per week, up to $4,000 for a maximum of 10 weeks	$4000
Student Summer Campus Housing	$60 per week, up to 10 weeks	$600
Total Expenses		**$1400**
Amount Requested (Total Expenses + Requested Stipends + Housing)		**$8100**

Have you applied for, or received funding from, another source to help support this project? (If no, skip a, b, and c below.)

X Yes ☐ No

a. Funding Source: **McKnight Foundation**
b. Amount: **$75,000**
c. Please explain how the Presidential grant will be used in addition to the other funding, and (if relevant), how the Presidential grant project would be impacted if external funding is not approved**.**

If the external funding is approved in full before this summer, I would return some of these funds back to the College. Specifically, I would return the faculty stipend, travel costs and some of the lab costs, but I would likely keep the student portion of these funds. I hope to know the status by early May and will let the Kendall Center know right away.

If the external funding is *not* approved, this project is viable as presented here. In other words, the project is not dependent on external funding.

Project Description

Background

The Minnesota River, a major tributary of the upper Mississippi River, is polluted by nitrate, excess sediment (turbidity), phosphate and other water quality parameters. Indeed, many streams and rivers in agricultural landscapes across the upper Midwest face these same pollution problems. For years, various stakeholders and state agencies have been trying to understand and reduce the pollution in the Minnesota River watershed. Toward that end, in 2014 the Minnesota Board of Soil and Water Resources (BWSR) granted $1.7 million to Nicollet County and the nonprofit Great River Greening to implement a wide variety of best management practices and erosion control strategies in the farms and public lands of Seven Mile Creek (SMC) watershed south of St. Peter. In effect, this is a large-scale experiment to determine whether voluntary implementation of best management practices and technologies can reduce sediment and nutrient pollution in a typical south-central Minnesota stream. If successful, this small watershed could give us a roadmap for how to improve water quality in the wider region. If unsuccessful, it will show that different measures – perhaps including additional regulation – are needed. Therefore, the stakes are high. However, the BWSR grant does not fund water quality monitoring. **An expanded and coordinated monitoring program is essential if we are to learn which land management strategies are most effective at improving water quality, with the hope of applying those lessons to similar agricultural landscapes across the upper Midwest.**

Proposed work

In this project, we will launch what will become a long-term environmental "observatory" at SMC, in that we will host much of the multidisciplinary monitoring of the watershed in coming years. We already have a team of interested Gustavus faculty who want to involve their students in monitoring the watershed. Also, Laura has already built substantive collaborations around SMC with Nicollet County, the Minnesota Pollution Control Agency, the Department of Natural Resources and researchers at the University of Minnesota. The momentum is building, and we want Gustavus to be at the center of this research.

Specifically, with this Presidential grant we will:

1. **Measure water quality at multiple locations in the watershed to identify pollution hotspots and to quantify changes**
   We will begin implementing the environmental monitoring program previously developed by the MN DNR and Fishers & Farmers. Water samples will be collected from multiple locations throughout the water season and analyzed for nitrate, suspended sediment and coliform bacteria. At least two of the newly-installed water quality improvement projects will be monitored to determine the magnitude of pollution reduction occurring from each. Flow and sediment fluxes will be measured out of one or more ravines that flow into SMC.

2. **Analyze and integrate the data that is produced by this monitoring and others**.
   We will construct GIS maps and models to contain and synthesize collected data, with support from Jeff La Frenierre (Geography; not seeking funding herein). For example,

we will assist Nicollet County staff with building a hydrologically-correct map of the watershed with geology, soil, land-use and hydrology information. We will use that dataset as a basis for field- and watershed-scale modelling that will, in turn, inform planning and assessment.

3. **Centralize scientific knowledge and facilitate rapid communication to the public**
   We will synthesize data collected by Gustavus and by public agencies and write the first of what will become annual technical reports for the SMC watershed. Also, we will write non-technical stories about how the work is progressing in the watershed. We will create and host a website for the SMC watershed observatory, wherein we will publish our data, reports and stories, and connect with other web portals from which data may be obtained. The website will also serve as a public outreach tool, so that stakeholders can have ready access to what we learn about the watershed.

Connor and Laura will work closely together on all aspects of this project. Laura will train Connor to do the field and laboratory work, so that by the end of the summer he will be proficient in a suite of techniques. They will work together on the GIS component, with Laura taking the lead until Connor becomes self-sufficient. And, they will work together to create and populate the website. Laura will take the lead on most communications with external partners, but Connor will participate in meetings with external stakeholders whenever possible.

At present, this watershed is ripe for the proposed monitoring and research because enthusiastic and knowledgeable personnel from the county are leading the BWSR effort, and are already formally collaborating with Laura (Geology) and Jeff La frenierre (Geography). The county staff has established contact with many landowners, held community engagement activities, and so forth, and is excited to support the scientific research proposed herein. Also, of course, SMC is near Gustavus, and Laura is very familiar with the watershed because she has previously involved many students in class activities and independent research projects there.

Many public and private entities are interested in the SMC watershed and several are already conducting limited environmental monitoring, e.g. the Minnesota Department of Natural Resources, the Minnesota Pollution Control Agency, the Minnesota Department of Agriculture, and several scientists at the University of Minnesota. However, the spatial and temporal resolution of the monitoring is incomplete, and there are several important environmental parameters that are not yet being measured at all. Also, at present no one is charged with 'connecting the dots', and it is challenging to track down each separate body of knowledge and synthesize what we're learning. Land management changes and policy decisions are being made *now*, though, and it's important that such decisions can be made with the best possible scientific understanding in mind. It is equally important that the impacts of policy decisions can be measured appropriately and that the resultant data be used to inform additional decisions. This proposal will advance those causes by collecting, centralizing and synthesizing data, and rapidly communicating it to stakeholder groups.

Anticipated Outcomes

Connor will begin work this spring, will work full-time (10 weeks) during the summer, and will continue in the fall as his Geology senior thesis. (This Presidential grant will, of course, only fund us during the summer. But, streams flow during the academic year too, so we will collect samples as needed, paying lab costs through departmental funds.) We will issue the first annual report by the end of February, 2017, and plan to have the website operational at that time.

1. *Robust water quality dataset:* The land-use changes spurred by the BWSR grant have already begun, and this year of data will provide valuable insight as to whether improvements are happening.
2. *A competitive proposal for external funding:* Laura is submitting a proposal to the McKnight Foundation which, if approved, could assist in funding this work this summer. Also, she is submitting a larger and longer-term grant proposal to the Minnesota Pollution Control Agency. If necessary, she will keep submitting proposals to external funders because she strongly believe this work needs to be done. Receiving a Presidential Grant this year will allow her to begin this important work and will help demonstrate to external potential funders that we are serious, competent and committed.
3. *SMC observatory annual report and website:* By writing a technical report summarizing conditions in the SMC watershed, we will help all researchers better understand the system and plan future research efforts. By creating and hosting a SMC website, we can finally centralize and organize all that we are learning about this watershed. The website will also help citizens understand the work that's being done, and help all participants keep track of projects. While this first year of data will not be enough to publish in a peer-reviewed journal, it is the first step toward a longer-term robust dataset that could be published in a number of water resource management journals.
4. *Scholarly presentations:* We anticipate presenting our findings to various stakeholders in the community and broader Midwest region. Also, of course, Connor will present his work to the summer student research group on campus, and will present in the fall and spring student research symposia. Depending on his interest and funding, he may also present his work at a regional conference of the Geological Society of America, the Midstates Consortium for Math and Science, or other such venues.
5. *Applied research experience for Connor Smith:* Connor is excited about the possibility of doing environmental research this summer. In geology, this kind of research experience is virtually a prerequisite for students to be accepted into graduate school or an entry-level job.
6. *Strengthened collaboration with internal and external partners:* This is a crucial year for building relationships among SMC stakeholders and thinking about how all the partners' strengths and interests can be integrated into an observatory. Laura will take the lead on these structural and managerial questions, but again will involve Connor in meetings and decision-making whenever possible.

Participant Information

Laura Triplett is an associate professor of Geology and is active in the Environmental Studies Program. She has been teaching and conducting research at Gustavus since 2007. The theme of all her research is to determine how human activities on the landscape change water quality in streams, rivers, lakes and oceans. She earned her M.S. and Ph.D. degrees at the University of Minnesota, measuring current and historical pollution in the Mississippi and St. Croix Rivers.

Connor Smith ('17) is enrolled as a full-time student at Gustavus Adolphus College. He is currently studying to major in geology and aspires to attend graduate school after obtaining his Bachelor of Arts degree. Studying river systems and environmental issues is of particular interest to Connor. His passion for conserving the ecosystem has led him to join environmental organizing and activist clubs such as Divest Gustavus and Greens.

Career and Educational Trajectories

Laura Triplett

My work is rooted in the earth sciences and encompasses elements of biology, chemistry, geography and physics. I enjoy working at the intersections of classically-defined disciplines, and I particularly love showing students that being curious about many different things can lead to excellent science. I seek out projects where my scientific contribution will lead to better decision-making by citizens and policy-makers. For example, in my M.S. research I determined the 'natural' (pre-European settlement) levels of nutrients and sediment in the St. Croix River, and compared those to the current higher levels. That work became the foundation for the current state and federal water quality policies being enacted for the St. Croix. My most recent major project, funded by the National Science Foundation, was to study how an invasive species of grass is changing water chemistry in rivers in the western U.S. My co-PIs in that project were a wetland ecologist from Utah State University and a geomorphologist from the University of Aix-Marseilles, demonstrating my desire to collaborate with and learn from scientists in other disciplines. Therefore, all of my previous research experiences have prepared me well for the challenge of establishing a long-term research observatory in the SMC.

Scientifically, this is a new direction for me. While I certainly have conducted plenty of water quality monitoring in various streams and rivers over the decades, I have never built nor led a long-term watershed project like this. Also, I have never before coordinated such a complex network of county, state and federal agencies, universities and nonprofits. However, so far all is going very well, and my collaborators at Gustavus and elsewhere have been enthusiastic and constructive. I think this will be a big thing for Gustavus for the next 5-10 years.

This is my ninth year at Gustavus, and every summer (except for 2015, as I began my sabbatical) I have supervised student researchers. I have built my research program to be completely accessible to students; in other words, I only conduct research that I know will be interesting and available to them. The SMC project proposed herein continues that tradition, and will build a foundation upon which I can involve many students for years to come.

During my time at Gustavus, I have supervised 13 full-time summer research students. Ten of those positions were funded (stipend and housing) from external grants that I obtained. The other three were funded internally (e.g., one student was funded by a grant from the

Margaret A. Cargill Foundation to the Environmental Studies Program), but until now I have never applied for a Presidential grant. I have a good track record of obtaining external funds, and believe that if I am now awarded a Presidential grant it will help me obtain external funding for upcoming years.

Connor Smith ('17)

This research opportunity would be very beneficial for both my academic and professional careers. As a geology major and aspiring geologist, this project would improve my qualifications immensely and provide me with invaluable experience in the field. One of the graduation requirements for all geology students at Gustavus is to complete research and write a thesis. I would use the research conducted with Laura to fulfill this requirement and thus be eligible to graduate in 2017. The geologic and environmental approach to this project resonates with me and compliments my fields of interest quite well. I am passionate about protecting the biodiversity of the Minnesota River and keeping the SMC watershed free of pollutants such as nitrates and other forms of agricultural runoff. I consider myself to be a diligent, independent student capable of logging long hours and producing quality work. I will commit myself to this project fully and make certain that my work is completed in a concise and thorough manner. If our research proposal is approved I will provide my services and skills to further researching the SMC watershed and be able to write my thesis.