

SOAR Project Proposal Summer 2013

Monitoring Long-Term Ecological Restoration Efforts in the Little Lehigh Creek Watershed

Faculty Adviser: Frank T. Kuserk, Professor of Biological Sciences and
Director, Environmental Studies & Sciences Program

Students:¹ Rachel Johnson
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Project Title: *Monitoring Long-Term Ecological Restoration Efforts in the Lehigh River Watershed*

Project Start/Ending Date and Length: May 28, 2013 – August 2, 2013 (10 weeks)

Project Description: For the past 15 years I have been working with the Wildlands Conservancy (3701 Orchid Place, Emmaus, PA 18049) on stream and riparian buffer restoration projects to reduce erosion, alleviate sediment buildup, enhance water flow, and improve water quality within the Lehigh River watershed. Under my direction a total of 12 Moravian College students have successfully participated in these projects as SOAR students.

Last summer's project, performed in conjunction with Ms. Megan Bradburn, Water Pollution Biologist with the Pennsylvania Department of Environmental Protection, documented high levels of fecal coliform and *Escherichia coli* bacteria in the tributaries of the Little Lehigh Creek watershed. The

two students who worked with me on this project are currently preparing to present their research at the 2013 National Conference on Undergraduate Research and the Mid-Atlantic Ecological Society of America meeting this spring.

The Wildlands Conservancy is continuing to pursue ecological restoration projects within the watershed, including the removal of dams that no longer serve a useful purpose. Dams, mostly run-of-river dams, are abundant throughout the Lehigh River watershed and its tributaries. They do not

¹ Stipends and support are requested for only two of the three listed students. The third student will receive an equivalent \$3000 stipend through an internship sponsored by the Wildlands Conservancy and the Moravian College Career Center through a grant from Wells Fargo Bank. Ms. Kristie Fach (Wildlands Conservancy) and Ms. Amy Saul (MC Career Center) can verify this award.

provide floodwater storage and, therefore, no flood control. These impoundments exacerbate flooding upstream, restrict fish passage, and degrade the water quality and wildlife habitat for long stretches upstream. Moreover, these dams are a liability to the landowners and can be hazardous to recreationists utilizing the stream. Removing dams results in significant benefits to the health of the stream and floodplain, and allow for fish passage of migratory aquatic species.

Because of our previous close working relationship we have been asked by Dr. Abigail Pattishall and Ms. Kristie Fach (Moravian College, Biology, 1999), Vice President for Conservation and Director of Ecological Restoration, respectively, to perform ecological assessments at several sites where the Wildlands Conservancy is petitioning to have dams removed along the tributaries of the Little Lehigh Creek in Allentown, PA. Our previous monitoring efforts have been valuable in that they have provided the Wildlands Conservancy with scientific evidence of the condition of streams within the watershed. This evidence has been used to successfully obtain grants from the Pennsylvania Department of Environmental Protection and the American Rivers Foundation to remove several dams on the Little Lehigh and Jordan Creeks.

Proposed 2013 monitoring activities: This summer we will work in partnership with the Wildlands Conservancy and the Pennsylvania Fish and Boat Commission to develop and implement a monitoring strategy with the goal of creating a baseline of existing stream conditions pre-dam removal along the Cedar Creek, a tributary of the Little Lehigh Creek, in Allentown, PA. Creating this baseline is the starting point and critical component to measuring and quantifying changes to the stream as a result of future dam removal projects.

The project assessments will consist of 1) collecting, identifying, and analyzing aquatic macroinvertebrate samples taken from the stream bed; 2) conducting electrofishing surveys at restoration sites in order to identify and quantify resident populations; 3) conducting physical habitat assessments (cover, substrate embeddedness, velocity/depth regime, sediment deposition, channel flow status, channel alteration, frequency of riffles, bank stability, temperature, vegetative protection and riparian zone width), 4) performing chemical assays (pH, alkalinity, specific conductance, phosphates, nitrates, dissolved oxygen); 5) performing fecal coliform and *E. coli* bacterial assessments at the various sites; and 6) riparian zone analyses and remediation.

The sampling and analyses will be conducted in accordance with procedures established by the U.S. Department of Environmental Protection. The information will be used to determine the effects of current stream restoration techniques on the physical condition and chemical composition of streams and, most importantly, on the composition of fish populations, streambed macroinvertebrate communities, and bacterial levels. It has been well documented that the composition of these groups are key indicators of stream health.

Qualifications and Certifications: I have attended workshops on benthic macroinvertebrate sampling and identification (SUNY College of Environmental Science and Forestry) and electrofishing techniques (Smith-Root, Inc., Vancouver, WA). I currently hold a Scientific Collector's Permit (#349) from the Pennsylvania Fish and Boat Commission to conduct benthic macroinvertebrate and electrofishing surveys. I have additionally conducted and published several scientific papers on microbial ecology.

Roles and Responsibilities of Faculty and Students:

Faculty Role & Responsibilities: For 15 years I have been working with the Wildlands Conservancy on stream monitoring and restoration projects in the Lehigh River watershed. As a result, I have engaged many Moravian College students in habitat restoration and ecological assessment projects through these collaborations.

My previous work at the Stroud Water Research Center provides both theoretical and applied knowledge of the dynamics of lotic ecosystems. I have published papers in the *Canadian Journal of Fisheries and Aquatic Sciences* and *Microbial Ecology* on the carbon dynamics of streams. I have also authored several technical reports for the Wildlands Conservancy. For this project I will assist the students in developing a background literature search, provide expertise in how to conduct physical, chemical, and bacteriological assessments, assist in fish and macroinvertebrate collection, identification and community diversity analyses, and guide them in the preparation of results for presentation and publication.

Students' Roles & Engagement in Scholarly Research: The students will participate in pre-project planning with Dr. Abigail Pattishall, Ms. Kristie Fach and me, collect, identify and analyze fish and macroinvertebrate samples using established protocols in order to maintain consistency with pre-restoration assessments. They will also conduct physical habitat assessments, chemical analyses and bacteriological monitorings. Completion of the habitat assessment will require them to characterize and rate (using a numerical score) a series of in-stream and riparian-related parameters. The students will prepare a final report analyzing the data for presentation and publication.

Student Benefits: The students will benefit by being part of a long-term ecological study that has great environmental importance. They will become part of a team of researchers and conservation scientists dedicated to improving stream habitat quality. In this way they will experience how modern ecological research is a collaborative effort involving many people, each contributing in a specific way according to their expertise. More importantly, their work will assist in determining whether currently accepted stream restoration techniques have a positive impact on streambed biological communities. They will need to operate both as team players and as individuals charged with the responsibility of learning accepted sampling protocols, performing physical, chemical and bacteriological assessments, identifying aquatic macroinvertebrates, and performing statistical analyses on the results. Additionally, they will gain experience in the writing of scientific reports and papers. Depending on the outcome of the project they will also prepare their work for publication either as a paper in a scientific journal and/or as a technical report issued by the Wildlands Conservancy. They will additionally present their work at Moravian College's Annual Student Scholarship and Creative Arts Day and at a scientific meeting such as the National Conference on Undergraduate Research or the Mid-Atlantic Ecological Society of America meeting next spring.

Student Statement of Purpose

Monitoring Long-Term Ecological Restoration Efforts in the Little Lehigh Creek Watershed

Student: Rachel Johnson

Major: Environmental Science/Computer Science

Expected Date of Graduation: May, 2014

Faculty Mentor: Dr. Frank T. Kuserk

Request for On-campus Housing: Yes

I want to participate in this summer SOAR project with Dr. Kuserk for the great experience, amongst many other reasons. I have learned very much in my science classes, but have not had very many opportunities to be involved with fieldwork and practical application of the courses I have taken. In this project I would be able to participate in scientific research allowing me to work with an environmental organization, the Wildlands Conservancy. I am intrigued by the topic of researching streams and lakes in the Lehigh Valley and learning the standard tests for water quality. This project will allow me to conduct research and learn the different stages, including fieldwork, collecting samples, and then analyzing them through chemical/biological means. I would gain experience in using specialized equipment and specific procedures for taking samples as well as solidify my understanding of the scientific method and statistical analysis. This is a very unique opportunity which I believe would affect me greatly and teach me new skills in ways that a classroom-learning environment could not.

In addition to the important scientific skills I would be gaining, I would also be learning to document my research through a scientific poster and report. I would also like to keep a personal journal about the experience that I could present as well, and reference to track my progression through the project. I would also present my research at Moravian and seize other opportunities, both in the Lehigh Valley and elsewhere, to share my experience. The skills improved from such presentations will always be helpful, and I would benefit from that and make use of them. I would also be introduced into the scientific community, which would be important for my future should I continue to graduate school or a research-intensive job.

I would like to participate in this project because I could use it as a starting point for future research, like an Honors Project. I am contemplating graduate school, and the experience from this opportunity would help me decide what I would like to specialize in, as well as helping my acceptance into graduate school. Internships also look favorably on experience, especially such generalized knowledge and practice as I would be getting. There are also many companies and government agencies that find candidates with specialized skills, like working with lakes and streams, and water quality tests, very desirable.

In addition to all the practical reasons for my participation in this particular SOAR project, I am very passionate about learning information about the environment firsthand, especially in an area close to Moravian College. It is very important to understand the effects of humanity, and other factors, on vital resources such as water, so that we do not compromise them, or need to spend a lot of money cleaning them up. At the root of all these issues is research, and knowledge is empowering, so I would like to be a part of something like this project that is important and can perhaps help the ecosystems of the streams. Research and conservation are something that I have always enjoyed being involved in, and this project would be a great way for me to gain valuable experience in both.

Student Statement of Purpose

Monitoring Long-Term Ecological Restoration Efforts in the Little Lehigh Creek Watershed

Student: Dana Fineman

Major: Environmental Science/German Studies

Expected Date of Graduation: May, 2015

Faculty Mentor: Dr. Frank T. Kuserk

Request for On-campus Housing: Yes

I would like to work on this summer SOAR project with Dr. Kuserk for several reasons. First and by far the most important, I would like to actually get some experience in the field. This type of project is the sort of thing that I can see myself doing after graduation. I want to find out before I graduate whether or not I like participating in this stuff. While I am fairly certain I will enjoy this kind of work, especially with the economy we are facing, I want to have that extra boost of confidence that I will enjoy this. Not only do I get the chance to work in the field, but I get the chance to speak about the project at Moravian College Scholar's Day. This will give me the opportunity to improve my public speaking abilities.

The slight economic ditch we are in leads to my second reason. I feel that it is virtually impossible to get a job without having prior job experience. Not only will this give me experience in my field, but it will also give me field experience that can open my options after graduation. I will have a better chance of getting a well suited job that interests me if I can obtain the experience that I need, and this program will give me that experience and more.

One reason is purely learning how to conduct and go through with an experiment. That is a very valuable experience and I am excited to learn how to do it properly. I am looking forward to the chance to collect specimens and then sort them, and through that information be able to tell if the stream is in good shape or not.

Another reason is that I am considering doing a Honors project my senior year. Completing the SOAR project will give me a better focus on what I would like to do, and could help me find a topic for an Honors project.

Student Statement of Purpose

Monitoring Long-Term Ecological Restoration Efforts in the Little Lehigh Creek Watershed

David Siepietowski

Major: Environmental Science

Expected Date of Graduation: May, 2015

Faculty Mentor: Dr. Frank T. Kuserk

Request for On-campus Housing: Yes

Upon hearing about the environmentally-focused SOAR research project this coming summer, I knew I wanted to be a part of it for several reasons. My first initial reason was that SOAR would offer me the opportunity to experience actual research within a field about which I am so passionate. To work with the Wildlands Conservancy and the Pennsylvania Department of Environmental Protection would grant me a chance to surround myself in a research atmosphere in which I one day hope to have a full career. After my undergraduate career here at Moravian College, I plan on attending graduate school to further my education in the environmental sciences. I also believe that SOAR would give me a chance to, in the future, explore other opportunities here at Moravian such as an Honors project, which I'm hoping to participate in as a senior. Being a part of the SOAR program would also allow me to familiarize myself with important technologies used every day in the field. During this time I would learn firsthand important techniques and vital field experience that will undoubtedly become useful in the future. I also was interested in the SOAR project because I'm an avid outdoorsman and the ability to apply intellectual learning to the skills that I have already gained through my work as a trail conservancy specialist on the Appalachian Trail would be hard to find in any other scholastic environment.

Not only do the academic aspects of this project entice me, but the ability to live out my passions and do so to better the environment in which we live draws me into this opportunity. I have done my best to take care of the nature community in which I have lived previously and have not had a direct opportunity to do so in my current community, the Lehigh Valley. Being able to give back in return for the beautiful landscape and extensive nature that has been preserved till I have arrived is something I very much so hope to accomplish.

Also, as I stated in the first paragraph, professional development would be a key aspect of this project. This project may not funnel me directly into the job or graduate school that I would like to see myself in, but the development of skills and the building of a personal relationship with a seasoned ecologist, Dr. Kuserk, will allow me to gain knowledge that someone in the classroom would simply not be able to achieve. Not only will this project develop me as a more inquisitive environmental thinker and more experienced field scientist, but also as a better scholar overall.

Expense Proposal

Monitoring Long-Term Ecological Restoration Efforts in the Little Lehigh Creek Watershed

Faculty Mentor: Frank T. Kuserk
Students: Rachel Johnson
 Dana Fineman
 David Siepietowski

Budget:

\$6000	Summer stipends (\$3000) for each of two students funded through SOAR (10 weeks x 40 hr/week x \$7.50/hr)
\$1750	Faculty stipend (10 weeks x \$175.00/week)
\$1000	Expenses as described below:
\$300	Since we will be using cars to travel to field sites we request a travel allowance of \$0.565 per mile up to a maximum of \$300. We will keep a log of travel mileage and submit it for reimbursement at the end of the project.
\$160	Licenses. Each team member requires a valid 2013 Pennsylvania Fishing License plus Trout Stamp (3 Residents @ \$32.40; 1 Non-resident @ \$62.40) to conduct electrofishing surveys.
\$ 40	2013 Pennsylvania Scientific Collector's Permit. This is required by the Pennsylvania Fish & Boat Commission in order to conduct electrofishing surveys.
\$500	Expendable laboratory supplies. Includes supplies to assay for fecal coliform and <i>E. coli</i> testing and chemical supplies for testing water quality. Equipment to conduct macroinvertebrate and electrofishing surveys are already available in house.
	From past experience it is anticipated that the total cost of laboratory supplies for this project will exceed \$1000. Additional supplies and expenses will be covered by the Environmental Studies & Sciences budget.
\$8750	Total