SOAR Project Proposal
Summer 2016

The Delaware River Watershed Initiative: Macroinvertebrate and Fish Community Assessment in the Upper Lehigh River Watershed

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

Students:

Richard Buffone	Josh Toth
Senior[1]	Sophomore
Environmental Science	Environmental Science
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Project Title: *The Delaware River Watershed Initiative: Macroinvertebrate and Fish Community Assessment in the Upper Lehigh River Watershed*

Project Start & End Dates: Tuesday, May 31, 2016 to Friday, August 5, 2016 (10 weeks)

Project Description: In 2014 Ms. Kristie Fach, Director of Ecological Restoration at the Wildlands Conservancy (Emmaus, PA), asked that I partner with them on the Delaware River Watershed Initiative (DRWI), a project coordinated by the Academy of Natural Sciences (ANS) of Drexel University to assess the condition of the streams within the Delaware River Watershed that assessed the impact of land use within the region. More than 50 nonprofits and academic institutions have joined together, aligning priorities for land protection and restoration projects and assessing water quality impacts using standardized methods. Partners are focusing on reducing agricultural runoff and urban stormwater in areas of lesser water quality, and they are protecting headwaters, forests, and groundwater reserves where water quality is high. Coordination among the many partners will allow the first-ever collection, synthesis, and analysis of data from sites across the Delaware River basin, generating critical information on what works in river protection and restoration. The Wildlands Conservancy-Moravian College partnership were asked to oversee monitoring efforts in the Upper Lehigh River Watershed, one of eight "clusters" in the DWRI.

During the summer of 2014 my SOAR students, Shannon Bensetler and Alejandra Kaplan, and I focused on conducting fish and benthic macroinvertebrate surveys in Sand Spring Creek, the site of a future PPL transmission line, Hickory Run State Park, and the relatively untouched headwaters of the Lehigh River in Monroe County. In 2015 my SOAR students, Courtnie Lambert and Andrea Giardina, and I concentrated on monitoring the fish and macroinvertebrate communities in the Aquashicola, Tobyhanna and Tunkhannock Creeks.

In 2016 we have been asked to perform fish and macroinvertebrate monitoring surveys at four sites on small tributaries in the Mud Run and Tunkhannock Creek watersheds and to follow up on two previous sites that we monitored in the past on the mainstem of the Tunkhannock Creek and the headwaters of the Upper Lehigh River (Fig. 1).

Proposed 2016 monitoring activities:

The specific activities this summer will consist of 1) collecting, identifying and analyzing aquatic macroinvertebrate samples taken from the streambed at various sites; 2) conducting electrofishing surveys at

[1] Scheduled to graduate in December 2016.

designated sites in order to identify and quantify resident populations; 3) compiling data and calculating community metrics (e.g. Hilsenhoff Biotic Index; Fish Index of Biotic Integrity).

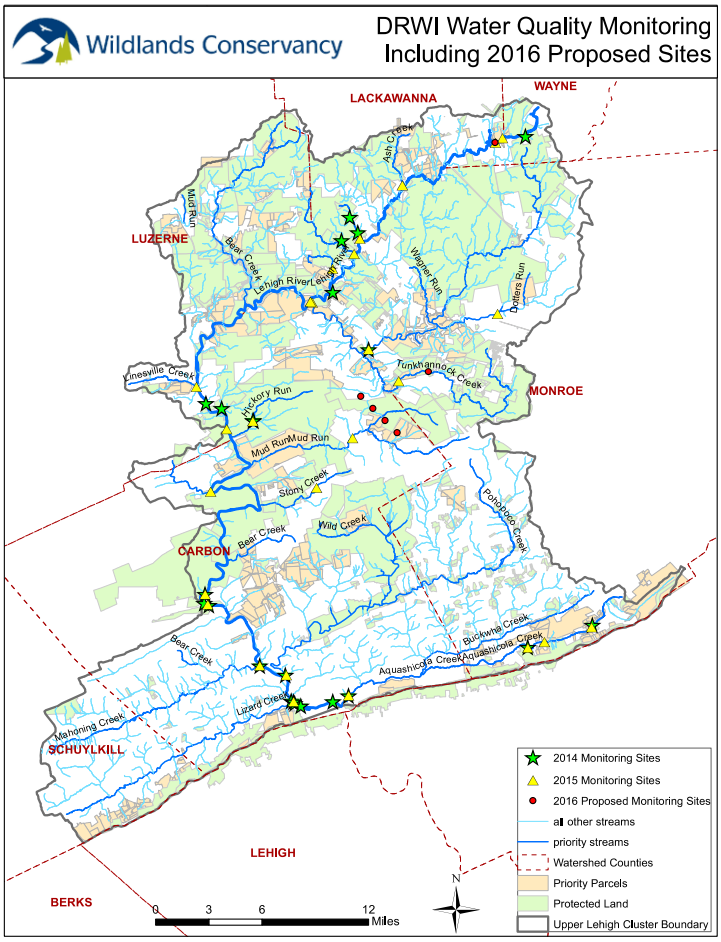

Figure 1. 2016 Proposed Fish and Benthic Macroinvertebrate Monitoring Sites

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.

Roles and Responsibilities of Faculty and Students:

Faculty Role: I have been working with the Wildlands Conservancy since 2001 on stream monitoring and restoration projects in the Lehigh River Watershed. As a result, I have engaged many Moravian College students in assessment projects because of these collaborations. My previous work at the Stroud Water Research Center (Academy of Natural Sciences of Philadelphia) provides both theoretical and applied knowledge of the dynamics of stream 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 based on collaborative projects and have published an article in *The American Biology Teacher* in which I describe how techniques developed as part of my research can be used in an undergraduate ecology class. For this project I will assist my research students, Richard Buffone and Josh Toth, to develop a background literature search, provide expertise in how to conduct the required assessments, assist in collection and analyses, and guide them in the preparation of

results for presentation and publication. Both of these students have completed BIOL 360 (Ecology) and are familiar with the techniques that we will use in this project.

Student Role: Richard and Josh will participate in pre-project planning with Ms. Kristie Fach, Ms. Kate Ebel and me, collect, and analyze samples using established protocols. They will assist in the analysis of the data that we collect and in writing the final report that will be given to the Wildlands Conservancy. Finally, they will prepare and deliver presentations at scientific meetings including the Landmark Conference Summer Undergraduate Research Conference and the National Conference on Undergraduate Research and will participate in next year's Moravian College Annual Student Scholarship and Creative Arts Day. Over the past five years I have had 22 of my SOAR and Honors research students present their findings at the annual National Conference on Undergraduate Research.

Timetable: Field sampling and laboratory work will consume the entire 10-week summer period. A report to the Wildlands Conservancy that provides an analysis of the data will be completed by October 1, 2016.

Justification for Involving Two Students in the Project: Ecological field research is a time and labor-intensive endeavor that involves teams of scientists. Electrofishing surveys require a minimum of three persons to safely operate the equipment, net the temporarily shocked specimens, and identify/count them. Macroinvertebrate surveys require a minimum of two individuals to handle the collecting net, collect, sort, identify and enumerate the resulting specimen collection. Even then we occasionally require additional assistance. For example, in order to perform a fish survey in a relatively wide stream, our team of three persons (two students plus myself) linked up with six others from the Academy of Natural Sciences.

Benefits to the Student, Faculty Member and Moravian College:

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 and land preservation efforts have a positive impact on streambed biological communities and overall water quality. They will need to operate both as team players and as individuals charged with the responsibility of learning accepted sampling protocols, identifying fish species and 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 technical report to the Wildlands Conservancy and the Academy of Natural Sciences. 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 next spring.

Faculty & College Benefits: I am eager to continue a research program that actively involves undergraduates and collaborates with local and state environmental organizations and individuals. Continued cooperation with the Wildlands Conservancy the Academy of Natural Sciences will assist us in providing our students with meaningful field experiences. This organization has provided meaningful opportunities for students engaging in scientific research, environmental policy, environmental management, and environmental education. Our Biology and Environmental Studies & Sciences Programs rely on our ability to develop strong relationships with environmental organizations.

SOAR Project Proposal
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Student Statement of Purpose

Project Title: *The Delaware River Watershed Initiative: Macroinvertebrate and Fish Community Assessment in the Upper Lehigh River Watershed*

Student Name: Richard Buffone
Major: Environmental Science
Date of Graduation: December 2016
Faculty Mentor: Dr. Frank T. Kuserk
Campus Housing: Yes

Participation Rationale and Expected Outcomes:

I believe that participating in a SOAR project with Dr. Kuserk will be an invaluable experience and a great opportunity to augment my college career at Moravian. There are several different reasons that I would like to take part in SOAR. The main reason I would like to do is SOAR is help me build a possible career path with experience. The area of environmental science and studies is something that I felt passionate about for a long time and this project will help me decide if it is the path for me. I am not one-hundred percent sure I would like to do as a career but I have always considered doing ecological research in the field. I have also taken the class Biology 360, which is ecology, and that class involved a lot of field research and that experience will only help facilitate the success of this project.

Another reason that I want to participate in this project is because a project of this nature will leave an impact on the Lehigh Valley. Even if our data does not reach solid conclusion, the data we will collect will be added to the copious amount of data that the Academy of Natural Sciences is collecting on the Delaware River watershed. With all of the information accumulated, we are better able to assess the quality of the watershed. The information shared will also help and lead other projects that will restore or help protect the Lehigh River. It will give me considerable contentment knowing that I will have a positive influence on the quality of a river that is close to home.

Another reason that I would like to take part in this SOAR project is because it will improve my already existing skills in the lab, field, and in a team. By participating in this project I know I will have responsibilities to the team in order the further the project. I will be working with other students from Moravian College and scientists who have professional experience.

Outcomes I expect from this project are honing my skills as a scientist and a researcher. Lab and field researchers need to have the skills of analyzing and presenting their work to other members of the scientific community. I will also learn how to efficiently collect large amounts of data by working in the field and working in a lab. Working under the wing of Dr. Kuserk, a respected research scientist, will help me learn skills that I would not have learned by reading a textbook. The expertise gained from this project will follow me throughout my career path into the future.

SOAR Project Proposal
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Student Statement of Purpose

Project Title: *The Delaware River Watershed Initiative: Macroinvertebrate and Fish Community Assessment in the Upper Lehigh River Watershed*

Student Name: Josh Toth
Major: Environmental Science
Date of Graduation: May 2018
Faculty Mentor: Dr. Frank T. Kuserk
Campus Housing: Yes

Participation Rationale and Expected Outcomes:

Participating in a SOAR project with Dr. Kuserk will be a constructive opportunity to allow me to further my scientific knowledge. There are many reasons as to why I would like to participate in SOAR. The main reason is because I think that doing scientific research in the field will help me to decide if this is something I'd like to pursue as a career. I'm not quite sure what I would like to do as a career for the rest of my life, but one option I've considered is doing ecological field research, so participating in a project, such as this one over the summer would be a way for me to see if this is something that I am both good at and interested in doing for a career. Learning to collect hands-on data in the field, as well as being able to identify aquatic macroinvertebrates and fish species seems like an incredible learning opportunity and an enjoyable experience as well. All this will aid me in my exploration if I want to get my doctorate and give back to others the experience that I have gotten from this opportunity.

Another reason that I wish to participate in this SOAR project is to help strengthen my skills in both the laboratory and the field. Since we are taking specimens in the field, as well as analyzing some in the lab, I will be able to advance both those skills. I also may realize I like fieldwork more, which will help me decide on a career later in life. Also, just in general, this is an incredible opportunity to learn a lot more than you can in a normal classroom setting, and to see how the lectures in the classroom can evolve into experiences that can be used in a career later in life.

By participating in SOAR, I will also be able to improve my ability to work in a team and as an individual. I know that I will have individual responsibilities that I will need to perform to move the project forward. I'll be working with other students from Moravian and other universities, as well as professional scientists as a team in this large-scale project.

Participating in this project will allow me to have the opportunity to experience field research firsthand. In doing so, this will enhance my skillset and knowledge of becoming an active environmental scientist in the scientific community. Gaining these skills will allow me to further my education and achieve my doctorate, which is one of my goals for my future, as I am also exploring the option of becoming a professor in this field.

Expense Proposal

Project Title: *The Delaware River Watershed Initiative: Macroinvertebrate and Fish Community Assessment in the Upper Lehigh River Watershed*

Faculty Mentor: Frank T. Kuserk
Students: Richard Buffone
Josh Toth

Budget:

$1000	Expenses as described below:	
	$300	Since this project involves extensive travel in the Upper Lehigh River Watershed to conduct sampling at field sites we request funds for gasoline. We will use the Environmental Studies & Sciences van for travel.
	$150	Licenses. Each team member requires a valid 2016 Pennsylvania Fishing License plus Trout Stamp.
	$ 50	2016 Pennsylvania Scientific Collector's Permit. This is required by the Pennsylvania Fish & Boat Commission in order to conduct electrofishing surveys.
	$500	Expendable laboratory supplies. This includes specimen collection vials and containers, reagents to conduct chemical assays, bacteriological media, petri dishes and membrane filters. Equipment to conduct macroinvertebrate and electrofishing surveys currently exists in the department 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.
	_____	
	$1000	Total