

SOAR Project Proposal Summer 2016

Turtle Population Dynamics in Three Ponds at the Lehigh Gap Nature Center

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

Students:

Shelby Does	Rob McKinley
Junior	Junior
Environmental Science	Biology
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Project Title: *Turtle Population Dynamics in Three Ponds at the Lehigh Gap Nature Center*

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

Project Description: Several studies have found skewed age and sex ratios in freshwater turtle species and these findings are often attributed to anthropogenic changes in the landscape (Gibbs and Steen 2005). A high concentration of roads near turtle nesting sites may, for example, selectively increase mortality of adult females, leading to a male-skewed population (Steen and Gibbs 2004). Increased predation of nests caused by a high density of predators that flourish in human-dominated landscapes (e.g. raccoons, opossums) may reduce juvenile recruitment and cause an adult-skewed population. As of now, each of these statements has not been rigorously tested due in part to the spatial restrictions of the few studies that have been conducted. In this project we will conduct turtle sampling in three lentic habitats at the Lehigh Gap Nature Center (LGNC) in order to determine the population structure of turtles across an urbanization gradient.

The turtle species that we study in this project may serve as model species for the conservation of other freshwater turtles. Worldwide, roughly 45% of freshwater turtle taxa are listed as threatened in the 2000 IUCN Red List of Threatened Species. By better understanding how common freshwater turtles respond to changes along an urbanization gradient, one can devise improved conservation strategies for the many imperiled freshwater turtle species.

Since 2012 students taking BIOL 360 (Ecology), BIOL 292 (Aquatic Biology), and BIOL 250/PSYC 250 (Animal Behavior) have been monitoring turtle populations in Mallard Pond, one of the three ponds at the LGNC, as part of a nationwide study on the effects of urbanization on these reptiles. Organized under the auspices of the Ecological Society of America, the TurtlePop Project involves faculty and students at 27 predominantly undergraduate colleges across the United States. To date we have captured 249 turtles, representing five different species, at our study site. Of these 131 different painted turtles (*Chrysemys picta*) have been captured, marked, and vital statistics (e.g. sex, age, size) recorded. A slightly skewed sex ratio of 52.8% male : 47.2% female exists in this pond. In this project we propose to census the remaining two LGNC ponds, Kingfisher and Wood Duck, to determine whether they have similar skewed sex ratios. In addition, we will determine whether any of the other four turtle species that inhabit Mallard Pond are also found in these ponds, and if so, in what numbers. Finally, by attaching small, electronic radio transmitters to their shells we will determine the extent to which these turtles migrate from one pond to another and the surrounding area. Differential migration, and thus mortality, of female and male turtles may be a reason for the observed skewed sex ratio seen in painted turtles (Bowne *et al.* 2006).

Proposed 2016 activities:

We will test these hypotheses at LGNC by conducting mark-recapture studies of freshwater turtles in Mallard, Kingfisher and Wood Duck Ponds using nylon hoop traps baited with sardines. Every turtle captured will be measured (length of carapace, plastron, right middle foreclaw, and pre-cloacal tail), sexed, and marked (notches filed into edge of carapace). Turtles will be released back into their native pond and a series of recapture censuses will take place. By knowing how many turtles have been previously captured (and hence have been “marked”) and the ratio of marked to unmarked individuals in subsequent samples, estimates of population size and composition can be determined using the Lincoln-Petersen Index (David and Winstead 1980).

We will also collect the following information characterizing each pond and surrounding landscape:

- Latitude and longitude (in decimal degrees) of center of each habitat sampled (coordinates can be obtained from Google Earth)
- Area of pond
- Dominant habitat substrate type (inorganic or organic)
- Amount of basking sites
- Permanence (Does the pond seasonally dry or does it typically hold water year-round)
- Area of land use (forest, wetlands, open water, impervious surface, agricultural, developed (e.g. lawns), and early successional) within 30 m of pond perimeters
- Density of road network within 100, 250, 500, 1000, and 2000 m.
- Area of land use (same as above) within 100, 250, 500, 1000, and 2000 m.
- Human population size within surrounding U.S. census block groups

Finally, we will attach small radio transmitters to the carapaces of turtles of different species, sexes and ages, and track their movements over time in order to determine whether there is differential migratory activity between the three ponds.

Qualifications and Certifications: For the past four years I have had experience trapping turtles at the LGNC as a participant in the nationwide TurtlePop Project. We presented the results of our first-year findings at a recent meeting of the Ecological Society of America and are currently preparing a manuscript of our results. In February 2016 I presented my findings on Mallard Pond populations to members and guests of the LGNC. I currently hold a Scientific Collector’s Permit (#349) from the Pennsylvania Fish and Boat Commission to conduct turtle surveys.

Roles and Responsibilities of Faculty and Students:

Faculty Role: I have been conducting studies on turtle populations at the LGNC as a participant in the TurtlePop Project since 2012. As a result, I have engaged many Moravian College students in this activity because of this collaboration. For this project I will assist my research students, Shelby Does and Rob McKinley, 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: Shelby and Rob will participate in pre-project planning with me, collect, and analyze specimens 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 LGNC and used in the TurtlePop Project. 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: Fieldwork will consume the entire 10-week summer period. A report to the LGNC 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. In this project a minimum of two individuals are needed to set the traps, collect the turtles, take measurements, and record the data. In addition, it is essential to not allow students to engage in fieldwork alone. These students will be working in a remote section of the LGNC property so proper safety protocols call for them to not work alone. While I will often be with them, at times I expect that they will need to work together without me.

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 studying an important group of threatened species. 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. They will need to operate both as team players and as individuals charged with the responsibility of learning accepted sampling protocols, identifying turtle species, 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 as a technical report to be published by the LGNC. 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 professional colleagues. Continued cooperation with the LGNC will assist us in providing our students with field experiences such as this. 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.

Literature Cited

- Bowne, D. R., M. A. Bowers, and J. E. Hines. 2006. Connectivity in an agricultural landscape as reflected by interpond movements of a freshwater turtle. *Conservation Biology* 20:780-791.
- David, E.D. and R.L. Winstead. 1980. Estimating the numbers of wildlife populations. Pages 221-245 in S. Schemnitz, editor. *Wildlife Management Techniques Manual*, 4th edition. The Wildlife Society. Washington, D.C.
- Gibbs, J.P. and D.A. Steen. 2005. Trends in Sex Ratios of Turtles in the United States: Implications of Road Mortality. *Conservation Biology*. 19(2):552-556.
- Steen, D. A., and J. P. Gibbs. 2004. Effects of roads on the structure of freshwater turtle populations. *Conservation Biology* 18:1143-1148.

SOAR Project Proposal
Summer 2016
Student Statement of Purpose

Project Title: *Turtle Population Dynamics in Three Ponds at the Lehigh Gap Nature Center*

Student Name: Shelby Does

Major: Environmental Science

Date of Graduation: May 2017

Faculty Mentor: Dr. Frank T. Kuserk

Campus Housing: No

Participation Rationale and Expected Outcomes:

As an aspiring environmental scientist, I hope to participate in the SOAR program because I am confident that it will provide me with invaluable practical experience in my field. Working with a researcher as knowledgeable as Dr. Kuserk will allow me to gain a more in-depth understanding of ecological fieldwork, while bolstering my plans to attend graduate school and making me a highly competitive career candidate in the future.

This project is uniquely hands-on because of the nature of fieldwork and generating primary data. These are prospects which spurred much of my interest in this particular endeavor, and which continue to excite me. I adore working closely with animals, and to be able to participate in a project to observe native species is an opportunity that would easily be one of the highlights of my entire college career. The SOAR program, for me, is a prospect to further my own education in one of the most compelling settings imaginable.

I also would like to take part in SOAR because of the incomparable chance to play a role in local conservation efforts. Having lived at the foot of the Appalachian Mountains for a number of years, I have become fascinated by the variety of ecosystems and animal populations in the Lehigh Valley and surrounding areas. This SOAR project allows for active engagement in studying these populations and aiding the environments that enrich life throughout the Lehigh River corridor.

By studying the population dynamics of turtles, I will be better able to grasp the protocols and practices of ecological studies working with live subjects, and understanding how they are affected by changes in their environment. I anticipate learning a great deal about the lives of local turtle species and their habitats, and becoming more comfortable observing and interacting with wild populations. I aim to use this experience to become a better researcher--a trait that can be used both in and out of the classroom.

On a larger scale, I expect this project will result in a more comprehensive knowledge of local turtle populations for all who are interested in these fascinating creatures. I am optimistic that it can become the basis for further in-depth research, and bring to light the importance of understanding populations of local reptiles in the area, and how they are impacted by human activity.

SOAR Project Proposal
Summer 2016
Student Statement of Purpose

Project Title: *Turtle Population Dynamics in Three Ponds at the Lehigh Gap Nature Center*

Student Name: Rob McKinley

Major: Biology

Date of Graduation: May 2017

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 a wonderful opportunity for my college career. Not only will it allow me to advance my studies at Moravian, but it will also provide me with experience in a related career field. I am currently undecided on where I would like to take my studies in the future, but recently I have come to realize that ecological and environmental studies are things that I truly feel passionate about. This project will give me an opportunity to see if I would enjoy a career in this field. I completed a similar project in high school where samples were collected from local streams and the organisms were identified to analyze the quality of the stream. I believe this background knowledge will help in the success of this project.

One reason I would love to participate in this project is because it will leave a lasting result on our area. Although we may not come to a solid conclusion by the end of the summer, our data will be added to the already massive collection of information that researchers across the U.S. have collected. With all of this information consolidated, we are better able to analyze the risks to turtle populations. This information can then lead to projects to restore and preserve threatened and endangered species. It gives me great satisfaction knowing that I may be able to have an impact on preserving our surrounding environment.

I hope that through this SOAR project I will be able to improve my existing lab and field techniques and learn new ones. Working alongside with Dr. Kuserk, a seasoned research scientist, will provide me with the opportunity to learn information that can not be learned in the classroom. With work being completed in the field as well as in the lab, I will become a better student and researcher. I hope I am able to make a contribution to the scientific community.

Expense Proposal

Project Title: *Turtle Population Dynamics in Three Ponds at the Lehigh Gap Nature Center*

Faculty Mentor: Frank T. Kuserk

Students: Shelby Does
Rob McKinley

Budget: \$1000

Expenses as described below:

\$300 Since this project involves extensive travel to conduct sampling at field sites we request funds for gasoline. We will use private cars/truck for travel.

\$150 Licenses. Each team member requires a valid 2016 Pennsylvania Fishing License.

\$ 50 2016 Pennsylvania Scientific Collector's Permit. This is required by the Pennsylvania Fish & Boat Commission in order to conduct turtle surveys.

\$500 Lotek Systems radio transmitters and receiver.

It is anticipated that the total cost of radio transmitter equipment and supplies for this project will exceed \$1000. Additional supplies and expenses will be covered by the Environmental Studies & Sciences budget.

\$1000 Total