

**REU Site: Ecology at the Urban-Rural Interface
Abstracts from Student Research 2010**



2010 REU Students at UA Field Station.

From Left: Mike, Deb (Grad student mentor/assistant), Bayoan, Tara, Mollika, Alysha. Not shown: Alexandria .



Scholar: Alysha Cypher

Mentor: Dr. Richard Londraville (Biology)

Major: Biology

Class Status: Junior

Institution: Clarion University of Pennsylvania/REU

"Uck! What am I swimming in?!" A Stream Comparison using Biochemical Indicators

Biochemical markers in fish are commonly used as a sensitive indicator of stream health. I compared Stoneroller Minnows from three streams in northeast Ohio; these streams vary in "health" as assessed by the Ohio EPA. Stoneroller Minnows, *Campostoma anomalum* was chosen because they are abundant, easy to identify and, as bottom dwellers, they come into contact with toxic substances. The streams chosen for comparison were Tinker's Creek, Furnace Run, and Yellow Creek. According to the Ohio EPA's Qualitative Habitat Evaluation Index, Tinkers Creek in Cuyahoga County is a polluted and stressed stream, while both Furnace Run and Yellow Creek are relatively unstressed streams. In order to compare stress in these streams, the enzyme catalase, and the hormone cortisol were chosen as stress indicators and compared between fish from each stream. I hypothesize that enzyme and hormone levels will indicate Tinker's creek as a more stressful environment for fish than Furnace or Yellow. Data from this experiment could provide more evidence for adverse human impacts on streams.



Scholar: Mollika Hossain

Mentor: Dr. Jessica Hopkins (Biology) and Dr. Chris Miller (Engineering)

Major: Biology

Class Status: Freshman

Institution: University of Florida/REU

Role of Phytoplankton Assemblage on Quantity and Nature of Carbon and DBP formation

Phytoplankton communities are a major contributor to the cycling of carbon within a reservoir. This study focuses on finding a correlation between phytoplankton assemblage and the quantity and nature of carbon, as well as the formation of disinfection byproducts (DBP) in the Barberton Reservoir. Samples were taken from a site near the water treatment plant periodically from four depths over a period of 48 hours based on variations in the light cycle. The HPLC technique was used to separate different pigments in the water and quantify their concentrations. The presence of certain pigments indicates the existence of particular algal groups in the water; the composition of the determined algal groups was calculated using an equation involving the ratio of each marker pigment to total chlorophyll a concentration. Additionally, fluorescence tests were performed on the same samples to acquire data about the quantity and nature of the organic matter. Tests for DBP formation were also conducted. All the data obtained were looked at collectively to find patterns and links between phytoplankton composition and organic matter and DBP formation temporally with regards to depth. The results of this study are significant because they will give insight into the role of phytoplankton activity on carbon and DBP formation; this may direct the depth at which the water treatment plant intakes water from the reservoir to change, therefore alleviating the harmful effects of DBP on drinking water.



Scholar: Michael Bennett

Mentor: Dr. Greg Smithj

Major: Biology

Class Status: Junior

Institution: James Madison University Virginia/REU/McNair

**Effects of patch size on nesting success
of ground-nesting, grassland birds.**

Grasslands serve as habitat and nesting grounds for a variety of North American birds, however changes in land use has resulted in a reduction in the amount of grassland habitat in North America; this change threatens the prevalence of grassland bird species in the United States. Recent management strategies have sought to restore grasslands, however restoration of these habitats requires knowledge of ideal patch characteristics to make informed management decisions. Patch size is an important factor in the utility of a patch for grassland birds; namely, whether a patch serves as a source or sink for birds. I quantified patch size as a Perimeter to area ratio (P:A ratio): an objective measurement of both patch size and amount of “core area” in a patch. I studied nesting success as an indicator or patch quality for grassland birds. Artificial nests, baited with quail eggs, were randomly located in 6 different patches in Summit County, Ohio along 5 different distance-to-edge strata. The exposure time for the nests was 10 days, with nest status being checked at the mid-point and end of this period. I found a negative correlation between P:A ratio and survival rate of nests. These results suggest that management of grasslands, in order to support bird communities, should focus on increased size and shape regularity for patches in order to maximize nesting success.

Scholar: Tara Buk

Mentor: Dr. Paco Moore

Major: Biology

Class Status: Junior

Institution: Cleveland State University/REU

Gene flow patterns in relic populations of *Eumeces fasciatus*

It is essential to understand meta-population dynamics for conservation management. A major obstacle to the preservation of animal populations is habitat fragmentation which often results in the loss of small population sizes. If these small populations are lost and there is no migration within the meta-population they cannot recolonize. This study will investigate the population structure of the five-lined skink, *Eumeces fasciatus* in Summit County, Ohio. I will use micro satellite markers to inspect the populations' genetic structure. This will be done by evaluating amount of genetic drift (genetic variation) between the various recently discovered populations. If these populations have drifted in their genetics from surrounding populations we can assume they are relic populations rather than part of a connected meta-population. The frequency and number of recapture will also be recorded in order to help evaluate the populations' viability. This data may also offer information on the genetic divergence of species due to habitat fragmentation and degradation.



Scholar: Alexandria Kemper-Taylor

Mentor: Dr. Don Ott and Dr. Randy Mitchell

Major: Biology

Class Status: Junior

Institution: University of Akron /REU

The Role of Identifying Algae within a Community

Learning how to properly study and identify plankton is a skill that takes much time and patience to master. The ability if used well can help with almost any type of water analysis, whether it is fresh or ocean. Knowing which types of algae grow in certain kinds of habitats allow for the relative pH, type of water, temperature, rough geological location and season to be derived in seconds. Many machines that can determine specific chemicals in the water rely on diatom skeletons which are made of opaline silica ($\text{SiO}_2 \cdot n\text{H}_2\text{O}$) and are almost impossible to destroy making the skeleton a wonderful record keeper of the health and different conditions of the body of water it was in on a chemical level. Finding what the algae like and what kills them and why can eventually determine what the 'ideal' image of what a freshwater microscopic habitat should look like. Identification skills are important in biology and can be used in other sciences such as chemistry, ecology, paleontology and even in the non-sciences such as business and construction. If I had time I would run a comparative study on the current algal composition of costal Lake Erie in the summer and check my findings against historical reports from the area that span a collective 150 years. This in turn could help answer questions about what has changed chemically in the water since then and possible determine some natural cycles the watershed goes through. This could also help determine a standard by which to compare rivers and streams to a healthy norm on a microscopic level.



Scholar: Bayoan Ware

Mentor: Dr. Dan Petit (National Fish and Wildlife Foundation)

Major: Biology

Class Status: Junior

Institution: Oberlin College/REU

Farming's for the Birds:

Avifauna as Indicators of Landscape Effects of Farming in the Cuyahoga Valley National Park

The Cuyahoga Valley National Park is a site of cultural significance in the United States, preserving the region's historic gems, and not only its natural beauty.

In 1999, the park decided to honor the region's agricultural traditions by leasing farms to qualified applicants. As the park's mission is two-fold, these farms aim to reduce their impact on the landscape surrounding the farms as much as possible, by practicing alternative methods of agriculture, such as crop rotation, the use of natural pesticides and construction of vegetation buffers. The objective of this study is to identify if alternative methods of agriculture accomplish their goal of minimizing landscape disturbance, particularly on farms surrounded by high proportions of natural forests. Four farms in the Cuyahoga Valley National Park were observed in the study. Three of the farms, regulated by the national park, used alternative farming methods. One independent farm implemented conventional practices.



This totaled to eight fields, five managed with alternative methods and three managed with conventional practices. Avifauna, fairly accurate measures of natural landscape health, were surveyed on the farm fields and in the adjacent forested habitat. The results of the impacts of the alternative and conventional farms on avifauna populations will be compared against each other to determine the differences, if any, on the forest landscape.



2010 REU Students. Top row: Alexandria, Alysha, random child, Bayona. Bottom Row. Dr. Mitchell, Tara, Mike, Deb, Mollika