

Regional Science Consortium

5th Annual Research Symposium

Tom Ridge Environmental Center at
Presque Isle, Erie, Pennsylvania

November 5-6, 2009

PROCEEDINGS



PRESQUE ISLE

**REGIONAL SCIENCE
CONSORTIUM**

at The Tom Ridge Center at Presque Isle

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At Presque Isle State Park

PROCEEDINGS

PRESENTATIONS

Thursday, November 5, 2009

Title: Tracking Purple Martin and Wood Thrush Migration Using Geolocators

Author: John Tautin, Purple Martin Conservation Association, Tom Ridge Environmental Center, 301 Peninsula Drive, Erie, PA 16505, USA. Erie, PA; Bridget J. M. Stutchbury, Scott A. Tarof, Tyler Done, Elizabeth Gow, and Patrick M. Kramer Department of Biology, York University, Toronto, Ontario M3J 1P3, Canada.

Abstract: We tracked the migration of Purple Martins (*Progne subis*) and Wood Thrushes (*Hylocichla mustelina*) from northwestern Pennsylvania in 2007 by mounting light-level geolocators on 20 and 14 birds, respectively. In 2008 we retrieved geolocators from two returning Purple Martins and five returning Wood Thrushes, and we analyzed sunrise and sunset times to reconstruct migration routes and estimate wintering locations. Both species made rapid spring migrations, with one Purple Martin migrating 7,500 km from central Brazil to Pennsylvania in 13 days. Most Wood Thrushes made the migration from their Central American wintering grounds to Pennsylvania in 13-15 days. Both species migrated across the Gulf of Mexico, and several individuals stopped for periods of time on the Yucatan Peninsula of Mexico. Additional Purple Martins and Wood Thrushes were marked with geo-locators in 2008, and several returned to be recaptured in 2009. Results from these 2008 marked birds are presented for the first time.

Title: Tick abundance and Lyme disease relating to Passerine migrants at Presque Isle State Park, Erie, PA

Author: Linnea Rowse, Audubon Pennsylvania, and Andrea Reinhardt, SCA Avian Conservation Intern

Abstract: Since the 1960s, migrant Passerine banding has been conducted at Presque Isle State Park. Banding operations have been operated by Audubon Pennsylvania since 2007. Audubon Pennsylvania, in collaboration with Yale University, has been collecting ticks from the banded birds to be used in a study on Lyme disease. The overall goal of the Yale University study is to determine the role that birds play in the spread of Lyme disease. Avian foraging strategies expose certain

species to ticks. Ticks were abundant on ground foraging species such as Gray Catbirds, sparrows, and thrushes. In fall 2008, species at Presque Isle testing positive for Lyme disease included a Common Yellowthroat and a House Wren. Birds are host to a couple different tick species, which may be a factor in Lyme disease presence.

Title: **A study of Anisoptera Diversity and Abundance in Clearfield County, Pennsylvania**

Author: Margaret J. Dicks, Edinboro University of Pennsylvania Advisor: Dr. Martin Mitchell

Abstract: Dragonflies are charismatic insects that are easily spotted in a variety of wetlands on warm sunny days. Many scientists have studied Odonates, however there is still a lot to learn about them and how they are influenced by their surroundings. The distribution of dragonflies is understudied and it is difficult to find accurate county records for species (Bried and Ervin 2005). These records are important in order to detect any changes in distribution and abundance that may indicate a significant change in the habitat quality. To determine what dragonflies are endemic to the Parker Dam and Moshannon forest areas, in Clearfield County Pennsylvania, I surveyed 20 sites between May 31 and September 19, 2009. Using scan sampling, I recorded the number and behavior of individual dragonflies as well as any exuviae present. After 97 surveys at different sites, different times, and varying weather conditions, a total of 41 species were observed in Parker Dam State Park and part of the Moshannon State Forest. The species I observed are surprisingly different compared to the check list of 40 dragonfly species for Clearfield County posted on the United States Geological Survey (USGS) (Kondratieff2000). According to my interpretation of distribution maps in the field guide Dragonflies through Binoculars, as many as 98 Anisoptera species may reside in Clearfield County (Dunkle 2000).

Title: **Shifting Sands: A Constructivist Coastal Laboratory for Environmental Geology at Presque Isle State Park, Erie, Pennsylvania**

Author: Patrick A. Burkhart, PhD, Associate Professor of Geology, Slippery Rock University

Abstract: Presque Isle is a veritable museum displaying a century of coastal engineering, as myriad strategies have been utilized to constrain the geologic evolution of the landscape. The exercise described herein takes advantage of the exquisitely visible nature of the engineering technologies that lie adjacent to the Stull Interpretive Center. For over a decade, this exercise has been revised and enhanced to maximize the enjoyment and educational value presented to students

participating in a one-half to full-day field trip. The unique combination of exceptional setting and a refined curriculum allows students to rapidly develop understanding about geologic processes and the struggle of society to constrain them.

Title: **Creating a GIS database of Penn State Erie, The Behrend College Campus**

Authors: Robert Acpli, Andrew Stauffer, Michelle Wunderley

Abstract: Penn State Erie, The Behrend College is a growing campus in need of quicker and more reliable ways to present the campus to students, faculty, staff and visitors; as well as conduct its maintenance duties. The ultimate goal of this research project is to use the ARCGIS program to show specific attributes of the campus and identify problem areas. Using a Trimble GPS unit, data was collected during the summer of 2009; including features such as emergency call boxes, fire hydrants and campus lighting. Other features such as building footprints, parking lots and mowed grass areas were heads up digitized using the ARCGIS program. When analyzing the data safety issues became apparent, and were considered vital to present findings to higher authorities. It was found that certain areas on the campus lack emergency call boxes in proximity to high traffic areas, other problems such as fire hydrant placement arose. Completion of this project will yield a database for the maintenance department. This database will allow maintenance to properly deal with issues in a timelier manner, by knowing the exact location of a problem. For example, each light post is fitted with an identification number which allows for the light post to be found in the database to determine the location for repair purposes. The heads up digitizing of grass covered areas or parking lots will allow them to have more precise projection as to the size of the areas on campus that need to be mowed or plowed.

Title: **Brown Bullhead Sediment Contact Time in Relationship to Water Temperature**

Author: Eric Obert, Pennsylvania Sea Grant

Abstract: In a study by *Loeb et al* it was reported that brown bullhead placed in an outdoor tank exposed to fall and winter conditions spent considerable time burying themselves in soft sediments as water temperatures decreased below 48 F. In the Loeb study the bullheads spent more time buried in the sediment as temperatures decreased. This is of considerable interest to fish pathologists studying cancer in benthic fish since painting of sediment extracts on brown bullheads has been shown to induce skin tumors in these fish (Black, J.).

Nine young of year brown bullhead, *Ameiurus nebulous*, size range 100-150 mm were placed in a 400 gallon flow through aquaculture tank containing 6- 8 inches

of Presque Isle Bay sediment at the Presque Isle Bay Marina Research Lab. Water from Presque Isle Marina Bay was piped continuously through the tank for the length of the study to simulate winter conditions. The bullheads movements were recorded daily via an aqua vue underwater camera attached to a TV containing a VCR recorder.

Title: Presque Isle Bay watershed restoration, protection, and monitoring plan: A GIS-based watershed management effort

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Abstract: In 2007, the United States Department of State removed the restrictions on dredging beneficial-use impairment from the Presque Isle Bay (PIB) Area of Concern (AOC) in response to the improved benthic-sediment conditions within the Bay, which historically had been impaired as a result of the legacy of industrial inputs and combined sewer overflows. To ensure that the quality of water and sediment entering PIB from its watershed will not contribute to future impairment of the PIB ecosystem, a comprehensive GIS-based data collection, evaluation, and analysis effort was undertaken to support the development of the *Presque Isle Bay Watershed Restoration, Protection, and Monitoring Plan*. The PIB watershed, located in northwestern Pennsylvania, drains a predominately urbanized area of approximately 67.90 km². Data collected as part of the watershed characterization (physical, chemical, and biological assessments) and natural resource inventory (land use, impervious cover, parking lots, buildings, floodplains, wetlands 30m riparian buffer zone, slope, and hydric soils) were used to develop a GIS-based restoration and protection model for the PIB watershed. Each of the watershed assessment and natural resource inventory parameters were scored on a scale of 0-5 (higher scores reflect higher priority) for the 78 analysis subareas based on criteria developed by a committee of agency staff, academia, scientists, and members of the public. Following the scoring of the 18 parameters, scores for each parameter were combined within each of the 78 subareas to get a total restoration and protection score. The resulting outputs of the models provided a prioritization of restoration and protection needs within the 78 subareas and are currently being used to drive restoration, protection, and monitoring efforts within the PIB watershed.

Title: **Alterations in glucose absorption across the small intestines of rats exposed to penta and deca brominated diphenyl ethers**

Author: Joshua Reynolds[§], Charles F. Nelatury[†] and Mary C. Vagula[§]

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Abstract: Polybrominated diphenyl ethers (PBDEs), a class of liposoluble, persistent organic compounds, are commercially produced fire retardants and are used in many household products such as plastics and fabrics. They have become a serious environmental concern due to their high molecular stability and inability to bond with the chemicals in which they are combined. It has been reported that their congeners, hydroxylated and methoxylated metabolites cause changes in neurological, reproductive, and endocrine functioning in animals. Unfortunately, the toxicity profile of PBDEs is not yet fully understood. Studies on their effects are somewhat limited, but demonstrate that PBDEs act as potential endocrine disrupters, neurotoxins, and lead to developmental and behavioral problems in laboratory animals. Environmental protection agency (EPA) is interested in establishing a trade off between fire safety and environmental protection / public health. Recently EPA has encouraged research efforts for assessing the toxic effects of PBDEs and keen bio-monitoring of the great lake sediments. Since the manner in which the PBDEs enter the organism is primarily through ingestion, the authors intend to investigate their effects on glucose absorption. This paper investigates to what extent PBDEs could cause mal-absorption and possible developmental delays by looking into the intestinal absorption of glucose and activity of Na⁺K⁺ ATPases in the basolateral membranes of rat small intestine. In some of our preliminary experiments, PBDE toxicity has brought about a significant decline in catalase activity in rats. The toxic congeners chosen for this study are penta and deca BDEs.

Key Words: Environmental toxicity, PBDEs, Glucose absorption, Na⁺K⁺ ATPase
This work is supported by faculty research grant from Gannon University.

Title: **N-Isopropylacrylamide Molecularly Imprinted Polymers for the Extraction of Caffeine**

Author: Kimberly C. Clarke and Clinton D. Jones

Mercyhurst College, Department of Chemistry and Biochemistry

Abstract: The ability to extract and quantify caffeine is important to the study of pharmaceuticals and personal care products released into the environment. Currently, there exists no official technique for extracting small amounts of caffeine from environmental water samples. We are working on the formation of molecularly imprinted hydrogel polymer networks as a novel extraction method for caffeine from water samples. A hydrogel polymer is a water-soluble polymer chain network. To imprint the polymer, the network is synthesized around

template caffeine molecules, which are subsequently removed from the gel. Removal of the caffeine leaves an empty site where only those specific molecules can fit back into the voids. Essentially, this polymer system has a “lock and key” construct: the template molecule is the key and the gel is the lock. Our molecularly imprinted systems are unique since they have the ability to respond to temperature changes in the solution. This property will be used to influence the efficiency of the system. Once developed, these systems will assist researchers in the extraction of specific molecules (such as caffeine) from water samples to determine their impact on the environment.

Title: **Analysis of caffeine in local waters**

Author: Michelle L. Clemens and Clinton D. Jones
Mercyhurst College Department of Chemistry and Biochemistry,
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Abstract: In this work, the amount of caffeine in local waters will be used as an indicator to determine if high concentrations of pharmaceuticals and personal care products (PPCPs) are present. Recently, small (approximately 50 mL) water samples were collected from Presque Isle in Erie, PA at Barracks Beach and Beaches 1, 2, 6, and 10 during July of 2009. Currently, no caffeine has been detected in the water samples that were directly analyzed using High Performance Liquid Chromatography (HPLC) coupled with a UV-vis photodiode array detector; this may be due to a low concentration of caffeine that cannot be detected via UV-vis. Larger water samples have been collected and will be extracted using Water Oasis® HLB Extraction Cartridges with a solid phase extraction (SPE) method. Efforts are currently focused on determining the most effective means of SPE as two different methods are being compared to find the best percentage of sample recovery. Eluates will be analyzed using HPLC, and the amount of caffeine detected will be compared to standards in order to determine the amount of caffeine in each sample.

Title: **Investigation of Polyaromatic Hydrocarbon (PAH) Separation via HPLC Mobile Phase Variation**

Author: Elizabeth A. Pillar, Clinton D. Jones
Department of Chemistry and Biochemistry, Mercyhurst College, 501 E. 38th
Street, Erie, PA 16546

Abstract: Polyaromatic hydrocarbons (PAHs) are multiple fused ring carbon compounds that are formed upon incomplete burning of many natural and industrial sources. Several of these complexes have been suggested to be harmful to humans, making them a source of interest for environmental groups, and researchers alike. Acetonitrile (ACN) is viewed as the industry standard as the high performance

liquid chromatography (HPLC) solvent of choice because of its physical properties and miscibility with water. Due to dwindling supplies, researchers need alternative solvents that provide clear separations with similar properties to ACN. The research conducted in this work looked at methanol (MeOH), tetrahydrofuran (THF), and methylene chloride (MeCl) as potential replacements for ACN. Based on the results of the three variant solvents, MeOH was found to be the only potentially viable replacement for ACN for PAH separations.

Title: **2009 Bacterial Water Quality Assessment of Presque Isle Bay, Erie, Pennsylvania**

Authors: Jeremiah Covert*, Biology Department, Penn State-Erie, The Behrend College; Jerry Covert, Ph.D., Regional Science Consortium, Erie, PA,

Abstract: Presque Isle State Park is a seven-mile long migrating peninsula, located on Lake Erie that curves to the east forming a 3,718 acre Bay for the city of Erie, Pennsylvania. Presque Isle Bay was designated the 43rd Great Lakes Area of Concern by the U.S. Department of State in January of 1991. In 2002, the Bay was designated as being in the Recovery State. Although vast improvements have been seen in the health of the Bay, the state of the bacterial water quality deserves continued attention. For the beaches of Presque Isle, the State Park and the Erie County of Health use U.S. EPA standards and posts swimming advisories when *E. coli* levels are greater than or equal to 235 Colony Forming Units/100ml, but less than 999 CFU/100ml and post swimming restrictions when the levels are greater than or equal to 1000 CFU/100ml. These same methods were used in this study of the water quality of Presque Isle Bay. For the past two summers (2007, 2008) Bay water quality has been studied and in general, it has been found that bacterial levels in the Bay have been within swimmable levels, regardless of weather conditions. This investigation expanded the previous studies to include samples from tributaries entering the Bay and in addition to plating samples for *E. coli*, studies were completed showing levels of *Bacteroides sp.* using real time PCR techniques.

Title: **Causes of P.I. Beach Swimming Restrictions: Where are we?**

Author: Jerry Covert, Ph.D., Regional Science Consortium, Tom Ridge Environmental Center, Presque Isle State Park, PA

Abstract: After years of collecting data, plating samples, doing real time quantitative polymerase chain reactions (qPCR), looking at predictive models, researching onshore currents, wind direction, wave height, and outflow from tributaries to the east and west of Presque Isle State Park, we still do not have a clear picture nor a sure predictive model to allow us to accurately know when the beaches are

contaminated on Presque Isle. This presentation will review the history and make a suggestion for future research direction using *Virtual Beach* software (multiple linear regression modeling) to analyze the past, present and future data to develop Presque Isle's own predictive model that will allow the park to, with a high degree accuracy, predict beach contamination exceedances and help identify the actually sources and causes of contamination.

Title: **Advances in Cochlear implants**

Author: Ryan Scanlon, Sudarshan R. Nelatury
School of Engineering, Penn State Erie, Erie, PA 16563-1701

Abstract: This paper focuses on not only the history of these devices, but also the current technology and future developments that are being undertaken. The cochlear implant has a long and rich history, dating back to the late 1700's. This review will explore the early research that laid the framework for current research in the field of cochlear implants. As of 2008, there were 120 000 users of the implant, with that number currently growing exponentially. The cochlear implant has become an enormously successful development thus far, with research on the topic expanding at a vast rate. With increases in numbers of users comes a greater demand in new technologies, which is accompanied by competing companies in the cochlear implant industry. This paper will review current technologies, along with disadvantages and advantages of these technologies. Due to the very adaptable nature of the devices, new signal processing techniques are constantly being developed and implemented for the use in current and future cochlear implants. These signal processing techniques will be explored, as well as new technology that must accompany them. Various issues with current DSP techniques limit the ability of cochlear implants to process complex signals such as music. Future research also includes advanced algorithms which will allow the users of these devices to perceive these complex signals, and increase their perception of the audible world. This paper will also investigate these techniques that are currently under development, along with DSP techniques that will be implemented in the near future.

Key Words: Cochlear implants, hearing impaired, digital signal processing

PRESENTATIONS

Friday, November 6, 2009

Title: **Eutrophication Status of Presque Isle Bay**

Author: Rick Diz, Ph.D., PE
Department of Environmental Science & Engineering, Gannon University

Abstract: A multi-year study of Presque Isle Bay water quality has led to the conclusion that Presque Isle Bay is moderately eutrophic. Data will be presented that documents the Bay's water quality in comparison to Lake Erie water in terms of organic carbon, Secchi depth, nitrogen, phosphorus, and chlorophyll concentrations. Dissolved oxygen levels with depth in the Bay indicate that while the Bay does not thermally stratify in the summer, there is nonetheless a thin anoxic layer of water just above the sediment-water interface that becomes very low in oxygen concentration. The presence of this low DO layer may have implications for the suitability of the sediments as habitat for sensitive benthic organisms. Additionally, prior studies of the water level changes in Presque Isle Bay suggest that eutrophication would be a much greater problem for Presque Isle Bay if water was not regularly exchanged with Lake Erie as is clearly the case.

Title: **Distribution and abundance of chemicals of concern in the beach waters of Presque Isle State Park**

Author: Ryan Hindman, Kendall Greene, and Steven Mauro*
Mercyhurst College

Abstract: *E. coli* abundance is used as an indicator of water quality at Presque Isle State Park (PISP). While much is known about this fecal microbe in PISP beach waters, less is known about its relation to biotic and abiotic substances that are potentially harmful to humans and aquatic wildlife. In this study, we utilized enzyme linked immunosorbent assays (ELISA) to examine the abundance and distribution of several emerging chemicals of health concern in the beach waters of Presque Isle State Park, including estradiol (hormone), PCB (industrial compound), fluoxetine (pharmaceutical), triclosan (anti-bacterial), and diuron (herbicide). Our results provide evidence that the distribution and abundance of these chemicals in PISP beach waters do not correlate with *E. coli* abundance. The implications of these findings for beach water management will be discussed.

Title: **Maternal genetic variance determined by sequencing *Odocoileus virginianus* (white-tailed deer) mtDNA D-loop**

Author: Lara Linden, Jacqueline McCullough, Mark Gooss, Andrew Berglund. Advisors: Durwood B. Ray, Frederic J. Brenner.

Abstract: From a limited number of studies involving electronic monitors, female white-tailed deer (*Odocoileus virginianus*) are known to be philopatric, ranging only a few square kilometers within their lifetime, whereas male deer are known to range in areas of 80 square km or more. Studies of mitochondrial DNA genetic variation to independently determine these breeding patterns are limited, and no genetic studies have been carried out in either Ohio or Pennsylvania. We are testing the hypothesis that deer within herds obtained from two municipal parks in Dayton, Ohio are more closely maternally related to each other than they are to the herd located in Mercer County, Pennsylvania. After isolating DNA from muscle or liver samples, the entire mitochondrial D-loop was amplified, purified, and sequenced. Each deer sequence obtained displayed a unique haplotype, or set of genetic variations. We discovered fourteen previously unknown haplotypes. We have previously published the D-loop of one deer from the Taylorsville Metropark in Dayton, Ohio, (accession number EU502913) and we have compared our new sequence data to that as the reference sequence. Haplotypes discovered in the two Dayton parks were highly similar within each herd and showed greater disparity with the Mercer County herd, supporting our hypothesis of female philopatry. This knowledge of breeding patterns and mobility is useful in game management. Our genetic study has confirmed the philopatry of female deer and has already shown that there are a large number of haplotypes within the whitetail deer population of Ohio and Pennsylvania.

Title: **Determining Breeding Patterns of *Odocoileus virginianus* by Nuclear DNA Fingerprinting**

Author: Michelle Peck, Richard Toth, Durwood B. Ray and Fred J. Brenner
Biology Department, Grove City College, Grove City, PA

Abstract: We are developing methods to study nuclear DNA from wild herds of white-tailed deer (*Odocoileus virginianus*) as a means to track maternal and paternal breeding history within various populations located in Ohio and Pennsylvania. Thirty-three samples from male and female deer at various ages were procured from parks in Dayton, Ohio and various counties in western PA. Procedures were developed to obtain DNA from liver tissue, hair or blood. Polymerase Chain Reaction (PCR) was used in conjunction with our unique group of fluorescently labeled primers in order to amplify 10 different short tandem repeat (STR) segments of the deer nuclear DNA. To enhance our deer identification procedures eight additional nonfluorescent primer sets are currently being studied. Most of our primer sets have been shown to work in closely related species. Gel electrophoresis was utilized to select desired PCR products. An Applied Biosystems 310 single capillary automatic DNA sequencer was used with the Gene Scan software to analyze the nuclear STR regions to create a unique DNA profile for individual deer. This method is analogous to forensic identification of humans using nuclear DNA. Based on allelic size and location, the DNA profiles are currently being

used to identify individual members within a complete herd of wild deer. One future objective is the combination of three STR regions into a single multiplex reaction mixture for a more rapid and efficient GeneScan analysis. The ultimate goal remains to study the breeding patterns of localized white-tailed deer herds by genetic variability and to determine the major fraternal contributor of each herd.

Title: **Determining Rates of Infection of *Peromyscus leucopus* with *Borrelia burgdorferi* on Presque Isle State Park**

Author: Isis Mariah Kuczaj, Cynthia Rebar, David Fulford
Edinboro University of Pennsylvania, Department of Biology and Health Services-Biology

Abstract: *Borrelia burgdorferi*, the causative agent of Lyme disease, has been identified in white-footed mouse (*Peromyscus leucopus*) populations on Presque Isle State Park. The purpose of the present research was to continue a longitudinal study on infection rates in *P. leucopus* to gain a better understanding of the enzootic maintenance of *B. burgdorferi*.
P. leucopus was trapped from July through September 2008. Sherman live folding traps (5.1x5.1x16.5 cm and 7.6x8.9x22.9 cm) baited with birdseed were set in the evening and checked in the morning for 2-3 consecutive days. Captured individuals were tagged, sexed, weighed, tissue-sampled, and released. Tissue samples were analyzed using Real-Time Polymerase Chain Reaction (RT-PCR) techniques. Results indicate that infection rates during the trapping season of 2008 of the *P. leucopus* with *Borrelia burgdorferi* was 12.5%. No differences were observed in the infection rates in males and females; juveniles, subadults, and adults; or in trapping habitats. Infection rates determined in this study are similar to those found in 2005 (10%; Smock, 2006), but differ from rates recorded in a 2003 study (75%; Lucore, 2003). These findings suggest that infection rates differ from year to year, with more study required to determine what causes yearly variation.

Title: **Wetland Rapid Assessments - Erie and Crawford Counties, PA**

Author: Karla Kaczmarek, Marti Martz, Erin Cafferty, Ray Bierbower - Pennsylvania Sea Grant; Kevin Hess - PA DEP

Abstract: Wetlands are among the most productive ecosystems in the world. They house more than one-third of the United States' threatened and endangered species and are home to thirty-one percent of our plant species (EPA). A wetland is defined by having more than fifty percent of the vegetation consisting of wetland plants and having soil that is saturated for at least ten consecutive days during the growing season. From May to October 2009, 175 randomly selected wetlands were assessed in Erie and Crawford Counties. The wetlands assessed occurred on

both public and private property. The wetlands were assessed primarily for stressors which included but were not limited to: invasive plants, roadbeds, tree harvesting, water withdrawal, and mowing. The most common invasive plants found during the assessments were multiflora rose (*Rosa multiflora*), common reed (*Phragmites australis*), and narrowleaf cattail (*Typha angustifolia*).

Title: **The Secret Underground Life of Switchgrass: Exploring Belowground Processes**

Author: Sandra Wayman, Dr. Richard Bowden, Ali Trunzo, Taylor Weiss
Allegheny College, Environmental Science; Ernst Conservation Seeds, sponsor

Abstract: Switchgrass (*Panicum virgatum*) is a native perennial prairie grass with great potential for alternative energy production as biofuel and biomass. Compared with corn, which is traditionally used for ethanol production, switchgrass can be much more efficient. This research examines two beneficial belowground processes in switchgrass: nitrogen retranslocation and carbon sequestration. Nitrogen retranslocation is the recycling of nitrogen between the shoots and the roots for the next growing season. We aim to calculate the fertilizer savings gained from nitrogen retranslocation and determine if it is economically better to harvest in the spring or fall. We will also compare nitrogen concentrations in different plant tissues. The second belowground benefit of switchgrass is the amount of carbon sequestered in the soil. Our study of belowground carbon found a 1:1 ratio of aboveground biomass to belowground biomass in switchgrass. We determined the concentration of carbon belowground and calculated its carbon-trading value per acre. The goal of these projects is to maximize the sustainability of switchgrass production.

Title: **The Erie County Natural Heritage Inventory Update**

Author: Pete Woods, Christopher Tracey - Pennsylvania Naturalist Program

Abstract: Within Pennsylvania, Erie County is uniquely rich in species natural communities of conservation concern, supporting many species and natural communities found nowhere else in the state. The Erie County Natural Heritage Inventory Update is a project of the Pennsylvania Natural Heritage Program partnership. It is an effort to identify and map the ecologically important areas of the county, prioritize them based on importance and conservation need, and provide information on threats and management recommendations. Results of this project will be publicly available, and can be used to improve conservation of these resources by informing planning efforts.

The original Erie County inventory was completed in 1993, and this new inventory will include updated information about old records, new occurrences,

expanded taxonomic coverage, improved mapping, and new landscape-level analyses. Our field work over the past 2 years, in combination with data gathered from partner organizations and individuals, provides a more detailed picture of the natural resources in Erie County. Noteworthy discoveries from our field work include one new plant never before observed in Pennsylvania, the rediscovery of one species considered extirpated from the state, new populations of several globally rare species, and several county records.

Since the first inventory, some species of concern have declined, while others are doing well. We have found that many species are threatened by land use conversion and resource extraction, while others are threatened by encroachment of invasive species or by deer browsing.

Title: The Effect of Invasive Vegetation on Avian Abundance and Nesting Success in a Southern Lake Erie Coastal Wetland

Authors: Chris Villella, Mark Lazaran, Robert Whyte, Carol Bocetti
California University of Pennsylvania

Abstract: Avian communities were surveyed at nine sites in two Lake Erie coastal marshes to quantify the effects of invasive vegetation on avian populations. Site selection was based on dominant vegetation (*Phragmites australis* n=3, *Typha angustifolia* n= 2, *Nelumbo lutea* n=3, and mixed emergent vegetation n=1 as a reference substrate). We recorded observations regarding avian abundance, behavior, and nesting. Surveys were carried out at three day intervals from May through August 2009. Although we collected data on all avian species, the majority of our observations stemmed from two species: the Red-winged Blackbird (*Agelaius phoeniceus*) and the Marsh Wren (*Cistothorus palustris*). Our results indicate that although avian abundance was higher in *P. australis* (Common reed) stands, the number of nests and the rate of nest success were much higher in *T. angustifolia* (Narrow-leaf cattail) when compared to *P. australis*. Avian behaviors also varied by vegetation type. Our results suggest that marsh bird nesting strategies in the Great Lakes region may be poorly adapted to *P. australis*, and that as *P. australis* continues to expand, remaining habitat will be of inferior quality in regard to maintaining long-term, stable avian populations.

Title: Dietary Analysis of Coyotes on Presque Isle State Park, Erie, PA

Author: Carrie Ann Duafala, Cynthia E. Rebar
Department of Biology and Health Services, Edinboro University of Pennsylvania

Abstract: The coyote (*Canis latrans*) is the largest mammalian predator on Presque Isle State Park. Numerous studies done throughout the United States have shown that coyotes prefer small prey as a main dietary resource, and that they scavenge large

prey when available. Yet, the diet of the eastern coyote in western Pennsylvania has not been thoroughly studied. In addition, because Presque Isle State Park receives over three million visitors a year, the opportunity exists for coyotes to include discarded human refuse as a food resource may be possible. Given the paucity of data on diets of coyotes in northwestern Pennsylvania, we designed a scat analysis study to determine the food resources being used by coyotes on Presque Isle State Park. Collection of coyote scat consisted of samples taken from designated trails in: spring (March-May); summer (June-August); fall (September-November); and winter (December-February). Thirty nine samples were collected throughout the year. Mass, length, and diameter were recorded for each scat sample collected. Scat were washed in nylon stocking bags to removed digested material and the remaining material was manually separated. In preliminary analyses of fall (September-November) scat samples, arthropods, plant material, fish, and small mammals were found, with rabbits as the most commonly encountered hair type. Thus far, discarded human refuse does not appear to be a significant component of coyotes' diets on the Park. Examination of scat from other seasons is continuing and will provide a more comprehensive understanding of the feeding habits of coyotes on Presque Isle State Park.

Title: **Invasion of Snakes to the Interior Forest Due to Fragmentation**

Author: Casey Bradshaw, Marshall University

Abstract: Forest fragmentation is one of the main causes for the loss of native biodiversity. One consequence is increased proportion of edge habitat that introduces new "edge" species, and makes habitat for interior forest living species non-suitable. This study will determine snake movement into a forest from the fragmented environment of a once continuous forest. Site locations are at Timberline Four Seasons Resort, Whitegrass Cross Country Ski Slope, and a US Forest Service road at Dolly Sods, in Tucker County, West Virginia. The main objectives of this study are to determine species richness and relative abundance of snake communities, how far species move from edge habitat into the forest and to determine whether snakes are a predatory threat to the federally protected Cheat Mountain Salamander. Area constrained surveys were conducted at each site June through mid-October 2009. Three transects were placed on each side along the forest edge, 8 meters and 17 meters from the edge. A vegetation analyses was conducted to quantify changes in plant communities. Snakes found were measured for snout to vent length, total length, gender and marked. Preliminary results show that the majority of snakes are found along the forest edge under cover objects where direct sunlight heats the ground/rocks. The highest concentration of salamanders is found along transects deeper into the forest, although they are found along the edge as well. Snake species included Northern-Ringnecked Snake, Red-bellied Snake, Eastern Gartersnake and Smooth Greensnake, all of which include a diet of salamanders to come extent.

Title: **The spiny softshells (*Apalone spinifera*) of Misery Bay and associated habitats on Presque Isle, Pennsylvania**

Author: Peter V. Lindeman, Department of Biology and Health Services, Edinboro University of Pennsylvania, Edinboro, PA 16444

Abstract: Although the spiny softshell (*Apalone spinifera*) is a widespread and often abundant turtle species in lotic habitats of eastern and central North America, populations in the greater Laurentian drainage have recently become the subject of conservation concern in Ontario, Quebec, and Vermont, where populations are believed to be very low. In 11 years of trapping turtles at Presque Isle, primarily in Graveyard Pond and adjacent Misery Bay, I have recorded only 51 captures of spiny softshells, just 1.6% of all turtle captures made. Only two recaptures are included in the total, however, well below recapture rates for four other turtle species, hence the population may be larger than indicated and consist of wide-ranging individuals that are rarely subject to recapture. Most captures have been in fykenets set during mid and late summer at the north end of Misery Bay, where capture success of spiny softshells, common map turtles, and stinkpots peaks in late August and early September. The secondary sex ratio is approximately 1:1 (24 males and 21 females), but exceptional sexual size dimorphism promoted by bimaturism produces a male bias in captures of mature individuals. Four hatchlings captured by hand in shallow water constitute the only young juveniles captured. The only consistently used nesting area known is the west shoreline of Thompson Bay.

Title: **Update to the Distribution of Allegheny River Fishes Using a New Sampling Technique**

Author: Benjamin D. Lorson, Jonathan A. Freedman, and Jay R. Stauffer, Jr. School of Forest Resources, Pennsylvania State University

Abstract: The Allegheny River contains the most diverse and unique fish assemblage in the state of Pennsylvania. The source of these fishes is through connections with surrounding drainages at different points throughout its geologic history. Documentation of this fauna is lacking, with the last comprehensive review completed by Edward Rancy in 1938. The adaptation of the benthic (Missouri) trawl to sample medium to large rivers has allowed researchers to sample habitats previously untouched by traditional sampling methods. An electrified benthic (PSU) trawl has led to the documentation of new species accounts, distributional expansions, and a better understanding of the ichthyofauna in Pennsylvania's Ohio River basin. A PSU trawl and experimental gill nets were used to sample 68 sites over approximately 300 kilometers of the Allegheny River from Kinzua Dam to Pittsburgh, PA in the summer of 2008. A total of 286 trawls and 88 gill net sets was completed within the study area. To date, 57 species have been

identified in the collection of over 10,000 fish that have been examined from this sampling effort. These data will be added to historic records to compile a comprehensive overview of the fishes of the Allegheny River. This information will lead to a better understanding of the distribution and abundance of some of Pennsylvania's species of special concern inhabiting the Allegheny River.

Title: **Distribution of Larval Fish in the Ohio River Basin, Pennsylvania**

Author: Richard B. Taylor, and Dr. Jay R. Stauffer, Jr.
School of Forest Resources, Pennsylvania State University

Abstract: The U.S. Army Corps of Engineers, Pittsburgh District, is conducting a feasibility-level study examining modernization of the three locks and dams on the Ohio River in Pennsylvania (Emsworth, Dashiields, and Montgomery locks & dams). To support both compliance and ecosystem restoration planning, the Pittsburgh District is compiling known information on the status and condition of biological and physical resources in the study area. A minimum of 10 species of darters (*Etheostoma*, *Percina*) spawn throughout the study area. Two species of darters (*Etheostoma maculatum* and *Etheostoma tippecanoe*) are present in the study area, but we captured no larva. *Percina macrocephala* larva were found only in the Emsworth Pool and *Percina shumardi* was found only in the Montgomery and New Cumberland pools. Young-of-the-year darter species were captured in the faster moving shallow waters found in the vicinity of the dams, with the exception of *Etheostoma nigrum*, which prefers a more lentic habitat. The other species of Special Concern (*Hiodon alosoides*, *Hiodon tergisus*, *Macrhybopsis storeriana*) all bred in the study area. Based on the data collected, breeding commences in the pools in early March.

Title: **Possible refugia of dreissenid mussels from predation by round gobies**

Author: Meaghan Ropski, Brian Wojtkielewicz, Dr. Greg Andraso, Gannon University,
Morosky College of Health Professions and Sciences - Biology

Abstract: Dreissenid mussels (zebra and quagga mussels) and the round goby (*Neogobius melanostomus*) have received considerable attention since their discovery in the Great Lakes. Several studies have shown that gobies prey on and may influence population structure of dreissenids. Our research from 2007 indicated that gobies prey disproportionately on medium-sized dreissenids in the 7-11mm size range. The purpose of this project was to investigate dreissenid size distributions in areas accessible (benthic surfaces) and inaccessible (vertical surfaces > 1m above the bottom) to gobies. We predicted that dreissenids in the 7-11 mm size range would be more abundant on vertical surfaces than on benthic surface. Dreissenids were sampled in September 2008 from both surfaces along the south pier of the shipping channel that connects Presque Isle Bay to Lake Erie. As predicted, size

distributions of dreissenids differed between vertical and benthic surfaces. Specifically, medium-sized dreissenids (9-12mm) were more abundant on vertical surfaces > 1m above the bottom than on benthic surfaces. Gobies may be responsible for the observed difference in dreissenid size distributions on the two surfaces. However, other variables such as predation by other species, plankton distribution, water temperature and current could contribute to the observed difference.

Title: **Size-selective predation on dreissenid mussels by round gobies (*Apollonia melanostomus*) in the field**

Author: G.M. Andraso and M.T. Ganger
Gannon University Department of Biology

Abstract: Dreissenid mussels (*Dreissena polymorpha* and *D. bugensis*) and round gobies (*Apollonia melanostomus*) are Ponto-Caspian invaders that have altered the ecosystems of the North American Great Lakes. Round gobies have been shown to prey upon a diversity of invertebrates and small fish, but their well-developed pharyngeal molars make them efficient predators of mollusks. A number of studies have shown that round gobies prey on dreissenid mussels, but there is an apparent shortage of detailed field studies on the subject. The objectives of this study were to 1) quantify the number and size of dreissenids consumed by different size classes of gobies, 2) compare the size of whole and crushed dreissenids that were consumed and 3) compare size distributions of consumed and available mussels over a five-month period during the summer of 2007. A total of 3839 dreissenid valves were recovered from 153 round gobies (TL=53-125mm) and composed nearly 100% of the goby diet. For all gobies combined and for each of the three goby size classes (53-81, 82-98, and 99-125mm TL), crushed valves were larger than whole valves. To some extent, the size distribution of consumed dreissenids reflected the size of available dreissenids throughout the season. Specifically, gobies ate large numbers of small (1-2mm) mussels when they were available. Although large gobies are able to ingest large dreissenids, 7-10mm mussels appear to be most important to all three size classes of gobies, especially late in the season. The apparent preference of round gobies for dreissenids approaching reproductive size suggests that they may play an important role in regulating dreissenid populations.

Title: **Brain Computer Interface**

Author: Sudarshan R. Nelatury* Penn State Erie; Charles W. Nelatury, Penn State University

Abstract: Brain computer interface (BCI) is a new area of research aimed at building a specialized interface that helps an individual with severe motor disabilities to

have effective control of devices such as simple relays, actuators, computers, speech processors, simple household appliances, and neural prostheses. This technology holds the promise for an individual's independence and higher quality of life and greater human satisfaction. BCI research is a multidisciplinary field. It integrates ideas from physiology, neuroscience, psychology, electrical and computer engineering, rehabilitation, and other related health-care disciplines. A BCI system allows direct translation of electroencephalogram (EEG) into actions, bypassing the usual muscular pathways. In the non-invasive system, it works by extracting the EEG of a subject, applying machine learning algorithms to classify the user's brain state, and performing a computer-controlled action. In a surgical procedure, the nerve endings from the brain are connected to an array of sensors, and the signals collected are used to activate simple tasks. One of the signal processing techniques most commonly used in interpreting the EEG signals and event related potentials (ERPs) for BCI purpose is independent component analysis (ICA). This method is a form of blind source separation based on higher order statistics or eigen space techniques. In this paper we discuss current strides being made in BCI research using ICA and related signal processing techniques and present some simulation results using MATLAB software.

Key words: EEG, brain computer interface, digital signal processing and independent component analysis.

Title: **Effective Diagnosis and Monitoring of Aortic Insufficiency Using Biomedical Signals**

Authors: Jonathan Georgino[§], Charles W. Nelatury[†], Sudarshan R. Nelatury
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Abstract: Aortic insufficiency or aortic regurgitation is a heart condition in which the valve between the left ventricle and the aorta malfunctions. This valve defect allows the pumped out blood to leak back into the heart. As a result, the left ventricle must work harder to pump more blood than normal. This increased work gradually causes the left ventricle to enlarge. In acute aortic regurgitation the symptoms develop rapidly and in severe cases, prompt surgery may be lifesaving. In chronic aortic regurgitation, the symptoms could develop over the course of many months or years. With the emergence of powerful signal processing algorithms, today it is possible to perform early detection of many cardiac disorders. In this paper we propose a new frequency domain technique to assess the severity of this condition. The electrocardiogram (ECG) and the phonocardiogram (PCG) signals are taken from internet database, the first author, and his dorm mate. The 60Hz power interference is filtered using adaptive noise cancelling technique. The time domain waveforms in case of aortic regurgitation evince certain high frequency content, which will become more evident for diagnostic purpose in the frequency domain through FFT spectrum. We also study the changes in the power spectral density (PSD) computed based on a parametric modeling. We find a marked

difference in the PSD when aortic regurgitation is present. The signal processing algorithms can be loaded into a dedicated DSP microchip and warning signals can be emitted in case of a patient with this condition. The simulations are done using MATLAB software.

Key words: Aortic insufficiency, ECG, PCG, digital signal processing

Title: **Space-Based Solar Power Generation**

Author: Jonathan Georgino, Sudarshan R. Nelatury
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Abstract: Space-based solar power (SBSP) generation holds the key to the most environmental-friendly and cost effective production of energy required by our constantly increasing energy-consuming world. This method, conceptualized in the late 1960s and the subject of much research and many successful experiments by NASA in the mid-70s, was deemed impractical and further development seemed to give way to higher-importance cold-war era projects; however, with today's advances in technology, it is imperative that we bring light back to this method as a possible solution to our energy needs and re-evaluate the feasibility of system realization and implementation. Key factors in developing this technology require a call for further research in microwave technology used for wireless power transmission and antenna design, as well as finding a low-cost launch system capable of carrying the vast amount of hardware beyond the earth's atmosphere. As our space agency is in the process of developing a new vehicle, there is no better time than to keep this topic in the foreground.

Key Words: Space based power generation, Microwave technology, Antenna design

POSTERS

Title: **Cross-linking Cellulase for Post-Catalytic Recovery**

Author: Jillian Bona, Naod Kebede, Lisa M. Unico
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(*Student Presentation*)

Abstract: Cellulose and starch are polysaccharides made purely of glucose. They differ primarily in the type of chemical linkages found between the glucose monomers. Cellulase is an enzyme that can break down cellulose from plants to produce free glucose by hydrolytically cleaving these polymers. Few organisms, such as fungi, can digest cellulose because they produce cellulase. The glucose monomers produced by this hydrolysis can be fermented into ethanol. Thus, with the use of this enzyme, cellulose could be used to produce ethanol from plant waste, e.g. corn stalks, which would decrease the impact of ethanol production on food prices. Cellulase is commercially available from Worthington Biochemical. Unfortunately, cellulase is expensive and, with current methods, is difficult to recover after its use. One of the main purposes of this study is to find a way to easily recover the enzyme making it more cost effective to produce cellulosic ethanol. This can be accomplished by attaching it to a solid material by a process called cross-linking. To date, an assay of enzyme activity has been established and chemical screening for the selection of an appropriate cross-linking agent is under way.

Title: **Preliminary Hydrogeologic Interpretations of the Jacksville Esker Chain, Butler County, Pennsylvania**

Author: Jeremiah Hyldahl, Quinten Cameron, Neil Durco, and Patrick Burkhart
Slippery Rock University
(*Student Presentation*)

Abstract: The Jacksville and Foster Road eskers of Butler and Lawrence counties, Pennsylvania, are adjacent to kettle wetlands that appear to be partially sustained by baseflow from the esker chain. A local mining company is trying to obtain permits for mining a proposed volume of around 250,000 cubic yards of aggregate from the Jacksville Esker. These permits are under review by the Army Corp of Engineers due to the kettle wetlands in question. The potential implications of mining include a permanent reconfiguration of topography, a decline in water quality, and a significant reduction of baseflow to surrounding wetlands. This reduction would possibly threaten not only an endangered species of bird, but also the existence of the wetlands themselves. A reasonable hydrogeologic interpretation of esker porosity is 20% with 80-90% saturation during wet hydrologic periods. These estimates indicate that the ridge of the Jacksville esker would reasonably contain roughly 1.2×10^6 cubic feet, or 8.8

million gallons of water during periods of high water storage. We interpret that the high porosity of esker sands and gravels provides storage for infiltrated ground water to the surrounding wetlands during periods when water tables are low. It is the purpose of our study to better understand this relationship between esker water storage and wetland recharge.

Title: **Beach Erosion and the Migration of Presque Isle Peninsula, Erie, Pennsylvania**

Author: Gregory Kolenda
Geosciences Department, Edinboro University of Pennsylvania
(*Student Presentation*)

Abstract: Presque Isle Peninsula is a natural wonder that is in the old age stages of its evolution. Without human interference this feature will continue to evolve until it ceases to exist. Many hard beach stabilization methods have been used in an attempt to prevent the migration of Presque Isle over the past 200 years. Current techniques consisting of a system of breakwaters and annual beach nourishment have proved to be the most effective method of shoreline protection.

Title: **Freshwater mussel, fish, and macroinvertebrate surveys in the major tributaries of French Creek, Pennsylvania**

Author: Tamara A. Smith and Elizabeth S. Meyer
Western Pennsylvania Conservancy

Abstract: The French Creek Watershed, located at the headwaters of the Ohio River drainage, is nationally recognized for its high aquatic species diversity. Twenty-five timed search mussel surveys were conducted throughout the ten major tributaries of French Creek, and fish and macroinvertebrate surveys were conducted at most sites. We recorded 22 live native mussel species, including federally endangered *Pleurobema clava* (Lamarck, 1819) (clubshell) and several other Pennsylvania State species of concern. In addition, we documented 48 fish species and determined that most mussels had at least one host fish species present at each mussel site. Macroinvertebrate surveys indicate good water quality throughout the tributaries. Fish species richness, mussel species richness, and macroinvertebrate genus richness had no significant correlations. We hope these data will help aid the restoration and protection of endangered mussels in this watershed.

Title: **Survey and Status Assessment of the Blanding's Turtle (*Emys blandingii*) in Pennsylvania**

Author: Ryan E. Miller

Western Pennsylvania Conservancy – Pennsylvania Natural Heritage Program

Abstract: The Blanding's turtle (*Emys blandingii*) has been designated as an "Immediate Concern" species in the Pennsylvania Wildlife Action Plan, and has been on the Pennsylvania Fish and Boat Commission's candidate list since the 1970's. However, very little information on the species' distribution in Pennsylvania exists: the species was last officially documented in the state in 1983. Consequently, there is a dire need for current information on the presence and distribution of *E. blandingii* in Pennsylvania. This study proposes to collect the necessary data to determine the status of the Blanding's turtle in the state. Historic locations are being surveyed to determine if those populations remain, and areas holding potential habitat will be assessed in an effort to discover new populations. The first year of field research has already been completed with four individual *E. blandingii* encountered in the Lake Erie basin and the mid and lower Conneaut Creek Watershed in northwestern Pennsylvania, which is the historic range of the species in the state. All of the Blanding's turtles that are captured will have the appropriate data recorded: exact location, age class, sex, health of animal, habitat information, etc. These data will help to determine not only the distribution of individuals, but also the size and viability of each Blanding's turtle population in Pennsylvania. The final report to the Pennsylvania Fish and Boat Commission will detail the survey methods and results, the status of the Blanding's turtle in Pennsylvania, the turtle's most important ecological requirements, and management recommendations based on our findings.

Title: **The City of Meadville's Greenhouse Gas Emissions Inventory and Climate Action Plan**

Authors: Prof. Jennifer DeHart, Andrew Pfeifer, Brendan O'Leary, Sam Elliot
Environmental Science, Allegheny College
(*Student Presentation*)

Abstract: Energy use in the City of Meadville was analyzed during the summer of 2009. Meadville received a Greenhouse Gas Pilot Grant and is working in conjunction with the municipality of Meadville and Allegheny College to reduce the greenhouse gases of Meadville over the next two years. The city of Meadville is part of ICLEI (International Council for Local Environmental Initiatives) and use ICLEI's software to manage its greenhouse data. Meadville's greenhouse data collection was completed this past summer with data up to the end of 2008. The database included bills for natural gas, electricity, gasoline, oil, and other miscellaneous expenditures associated with greenhouse gas emissions. A comparative database was also generated during the study period to provide comparative examples from other cities. The two databases will generate comparative information about the options for mitigating Meadville's greenhouse gases in ways that have worked in comparable communities.

Title: **Hydrogeologic Monitoring of a Headwater Wetland in the Four-Mile Creek Watershed**

Authors: AM Foyle & MS Ritz (co-presenting), MD Naber
Geoscience Program, School of Science, Penn State Erie – The Behrend College,
Erie PA 16563
(*Student Presentation*)

Abstract: An undergraduate research project begun in Spring 2009 initiated long-term monitoring of a headwater pond and fringing wetland system. The goal was to characterize the hydrologic characteristics of a perennial forested wetland over an initial study period of several months. The site is located on the Penn State Erie – Behrend College campus in the headwaters of 4-Mile Creek. The wetland lies at an elevation of ~350m MSL, has a surface-water catchment area of ~6000m², and includes a perennial pond and two seasonal wetland swales.

Within 10m of the pond perimeter, a group of three 2.5cm PVC screened monitoring wells were installed at each of the four cardinal points of the compass: a shallow (43cm) soil-profile well, a deep (84cm) glacial-till well and a combination (92cm) well. A water-level gauge was installed in the pond. The wells were designed to monitor the water table within the soil profile (~0.3m thick) and/or underlying glacial tills (>10m thick) using the tape-&-chalk method. Climate data were collected from a weather station located 1200m from the site. Site topography was mapped using a Total Station supplemented with LiDAR data.

Preliminary results suggest that the pond and wetland constitute a recharge system ~85% of the time with groundwater flowing from the pond-wetland out into the surrounding forest. Following major rain events (>5cm/day), the pond-wetland becomes a discharge system for up to several days. The water table beneath the largest two of five catchment sub-basins responds rapidly (1-2day) and dramatically (60-80cm) to heavy (8cm/day) rainfall events.

Title: **Bacterial antibiotic resistance in water samples and feces of round gobies (*Neogobius melanostomus*) and bluegills (*Lepomis macrochirus*) from Lake Erie and Presque Isle Bay**

Author: Thomas J Russo¹, Sean Fouse¹, Krista Mershimer¹, Troy Skwor^{1, 2} and Greg Andraso¹
¹Gannon University, Biology Department, Erie, PA 16541-0001, ²Children's Hospital Oakland Research Institute, Oakland, CA 94609
(*Student Presentation*)

Abstract: The abundant use of broad-spectrum antibiotics in feedlots, their clinical overuse, and their improper disposal has aided bacterial resistance against multiple antibiotics. The presence of benthic species, including filter feeders and their predators (e.g. dreissenid mussels and round gobies), might provide a medium for increased exchange of resistance genes. In this study, we investigated the percentage of antibiotic resistant bacterial populations from benthic regions at five different sites. Water samples were collected from an offshore site, near the discharge of the city of Erie's wastewater treatment facility, near the mouth of Mill Creek, and the South Pier. We also analyzed feces from invasive round gobies collected from the South Pier site and native bluegills collected from the Marina Bay site to compare with antibiotic resistance in water samples. All samples were plated on MacConkey agar in the absence or presence of ampicillin (8µg/ml), kanamycin (4µg/ml) and tetracycline (2µg/ml) to select for gram negative bacteria. Aquatic samples demonstrated > 60% ampicillin resistance and >10% kanamycin resistance from all collection sites. However, minimal resistance was observed against tetracycline. Similar to aquatic samples, gobies and bluegills had high levels of antibiotic resistance for ampicillin and kanamycin, though resistance patterns differed between water and fecal bacteria. These findings highlight the high prevalence of antibiotic resistant bacterial populations coexisting in Lake Erie and its fauna.

Title: **Methicillin-resistant *Staphylococcus aureus* carriage rates in Erie County, Pennsylvania**

Author: Leslie Y. Schlaud and Christopher C. Keller, Ph.D., C.P.H.
Laboratory of Human Pathogens, Lake Erie College of Osteopathic Medicine
(*Student Presentation*)

Abstract: *Staphylococcus aureus* is a bacterial pathogen that causes human infections ranging from mild skin infections to life-threatening pneumonia. *S. aureus* is carried by approximately 20% of the population. Emergence of Methicillin-resistant *S. aureus* (MRSA) has made treating *S. aureus* infections difficult. MRSA infections can be acquired from both the hospital (HA-MRSA) and community (CA-MRSA) settings. This study aims to determine the carriage rate of HA-MRSA and CA-MRSA in Erie County.

To determine the MRSA carriage rate, nasal swabs will be obtained from healthcare and non-healthcare workers within Erie County. Swabs will be streaked on Mannitol Salt agar and *S. aureus* colonies will be identified and subcultured. Samples will then be grown in the presence of various antibiotics to determine susceptibility. In addition, DNA will be isolated from samples using the Chelex method. The presence of DNA sequences for Staphylococcal 16S rRNA, *mecA* (which determines methicillin resistance), Pantone-Valentine

leukocidin (which determines HA-MRSA or CA-MRSA), and SCCmec type will be amplified using specific PCR primers.

The PCR primers specific for 16S rRNA and *mecA* have successfully distinguished between *S. aureus* and MRSA strains. Preliminary experiments on a population of non-healthcare workers (n=48) showed that (21%) were *S. aureus* carriers, however, none of the samples tested positive for MRSA. Successful completion of this project will assess the risk of acquiring MRSA infections in Erie County, PA.

Title: **A Role for the Auxin Uptake Carrier in Auxin-Induced Gene Expression**

Author: Stephen A. Shinsky, Dr. Catharina Coenen
Department of Biology, Allegheny College
(*Student Presentation*)

Abstract: The plant hormone auxin coordinates growth and development in plants, including agriculturally important traits, such as root and shoot branching, fruit growth, and wood formation. Understanding the molecular mechanisms of auxin action therefore is important for increasing crop yields and predicting plant responses to global climate change. Auxin regulates plant growth through inducing transcription of specific genes. Here, we explore the role of cellular auxin uptake on the induction kinetics of the auxin-responsive *GH3* promoter, which is linked to a *luciferase* gene from fireflies. Hypocotyls from tobacco seedlings carrying this gene construct glow in response to exogenously applied auxin, and promoter activity can be quantified over time through counting the number of photons emitted from the plant tissue. Effects of auxin uptake on gene expression are hard to assess, because the natural auxin indole-3-acetic acid can enter cells by passive diffusion in addition to active, carrier-mediated uptake. We used indole-3-methanesulfonic acid, a highly acidic auxin analog, whose entry into cells is entirely carrier-mediated, in conjunction with 1-naphthoxy-acetic acid, an inhibitor that blocks the action of the auxin uptake carrier to demonstrate that cellular auxin uptake affects the time course of auxin-inducible gene expression.

Title: **A long record of sedimentation and landscape change from Sugar Lake, Crawford County, PA**

Author: Eric C. Straffin*, Todd Grote**, Kyle Jones*, Zachary Robertson*, and Brian Zimmerman*
*Edinboro University of Pennsylvania, Department of Geosciences
**Allegheny College, Department of Geology
(*Student Presentation*)

Abstract: Sugar Lake, located in northwestern Pennsylvania, is a moraine-dammed lake at the outer margin of the Kent end moraine complex. Sugar Lake contains a continuous record of sedimentation dating back to the last glacial period, ca 14kya. Analyses of a 12 meter long sediment core recovered near the deepest part of the lake permit interpretations regarding environmental change within the watershed during the post-glacial period. The oldest sediments record an early phase of predominantly clastic, silty sedimentation when glacial ice still existed within the valley. Annual summer/winter cycles (varves) are evident as alternating light grey silt and black organic laminations, respectively. As the volume of ice diminished and glaciers retreated northward, silty sediments were gradually replaced by organic sediments. That trend was terminated by a rapid change to predominantly homogeneous organic sedimentation, which likely marks the transition to an ice-free valley and climatic amelioration. Organic sedimentation dominated the Holocene, but several influxes of clastic material, recorded by variation in magnetic susceptibility of the core, suggest episodes of landscape instability related to environmental change. A final phase of increased magnetic susceptibility is likely related to human-induced hillslope erosion over the last 100 years.

Title: **Soil geomorphology and Holocene floodplain stability along French Creek near Meadville, Pennsylvania**

Author: Todd Grote*, Eric C. Straffin**, Jon Malzone**, Kyle Jones**
*Allegheny College, Department of Geology
**Edinboro University of Pennsylvania, Department of Geosciences
(*Student Presentation*)

Abstract: Soils and sediments within floodplains of French Creek, northwestern Pennsylvania, provide a record of changing landscape stability related to environmental and land-use changes over the last several thousand years. Sediments were deposited by flood events, and can be categorized into coarse sediment facies deposited within channels by lateral accretion, and by finer, overbank facies. Soils were formed during periods of relative floodplain stability, and vary as a function of landscape position and age. Soils also mark the upper and lower boundaries of distinct sedimentary packages, thereby defining the alluvial stratigraphy. Variation in facies and soils through time thus reflect changes in floodplain processes and landscape stability.

The oldest sediments in the study area are characterized by lateral accretion and channel abandonment via active meandering of French Creek. Younger sediments are characterized by alternating, vertically stacked overbank facies separated by buried soils. The youngest soils define a package of post-settlement alluvium (PSA) associated with Euro-American settlement within the watershed, beginning in the late 18th Century. PSA soils are weakly developed and occur at the lowest elevations near stream channels and sometimes cap older soils on higher portions

of the floodplain. Cumulative prehistoric soils within abandoned channel fills are buried beneath PSA soils, and can be physically traced to equivalent surface soils in stable landscape positions that typically contain one or more B horizons. The oldest, most stable landforms have better developed B horizons and typically lack evidence of buried land surfaces.

Title: **Introduction of Novel Point Mutations into MSH2 and MSH6 DNA Mismatch Repair Proteins**

Author: William Dillen*, Gregory Sondag*, Dr.Lisa Unico* (EUP) Karin Scarpinato**
*Edinboro University
** Wake Forest University
(*Student Presentation*)

Abstract: Mismatch repair proteins (MMR), MSH2 and MSH6 have been identified as having the ability to initiate cell death. This ability to initiate cell death makes them a possible target for cancer treatment. If the pathway that is activated by the two MMRs can be identified, it could be possible to use chemotherapy to signal cancer cells to initiate cell death. Thus, the chemotherapy would harness intrinsic defenses.

One of the first steps is to identify the functional domains of the MSH2 and MSH6. This can be accomplished by introducing point mutations (single base changes to the DNA) into the genetic sequences responsible for coding MSH2 and MSH6. Mutations are accomplished using a Stratogene Mutagenesis kit with primers of known sequence. The plasmids produced are then sent to be sequenced to verify the incorporation of the mutation.

The mutated sequences are then introduced into MSH2 and MSH6 deficient cells. The cells are then tested for both the presence of MSH2 and/or MSH6 and the potential restoration of MSH2 and/or MSH6 functionality. If the presence of MSH2 and/or MSH6 has been restored, but functionality has not, this indicates the incorporated point mutation was critical to protein functionality. If both presence and functionality are restored, the point mutation is not detrimental to the functionality of the MMR.

Title: **Microbial Ecology of Freshwater Turtles**

Author: David A. Stull Jr.*, Jeanette L. Schnars**
* Penn State Erie
** Regional Science Consortium
(*Student Presentation*)

Abstract: Female freshwater turtles go to great lengths to ensure that their offspring will survive: selecting a nesting ground they deem appropriate and burying their eggs.

It has also been hypothesized that developing turtle eggs receive help from a microscopic force, bacteria. Over the summer of 2009, bacterial samples were taken from a female snapping turtle and various soil samples from Presque Isle State Park. The samples were isolated, by means of the streak plate technique and individually plated. In future work, turtle bacteria will be plated against soil bacteria to identify if bacterial resistance exists within the turtle bacteria.

Title: **Old Growth in the East? Forest Structure in Chautauqua County Swamps**

Author: Alex Staunch, Lauren O'Neill, Kevin Ludwig and Jonathan Titus
Biology Dept., SUNY-Fredonia, Fredonia, NY 14063
(*Student Presentation*)

Abstract: Trees in sixteen 900m² plots at Elm Flats, Bonita Swamp and Bentley Preserve, swamps located near Chautauqua Lake, were identified and measured. The most common trees in these swamps forests were green ash, Freeman's maple and American elm. At Elm Flats trees exhibited a hump-shaped basal area distribution with a high proportion of shade tolerant trees in the larger size classes. This is indicative of a forest that has been subjected to limited anthropomorphic disturbance and possibly retains some old growth characteristics. Trees at the other two sites exhibited traits more characteristic of mid-successional forests. These permanent plots are being established to assess the effect of the emerald ash borer, when it arrives, on these forests.

Title: **The Effect of Hydrology and Substrate on Germination of Three Wetland Woody Plants**

Author: Alex Staunch, Vanessa Ricotta, Kevin Ludwig and Jonathan Titus
Biology Dept., SUNY-Fredonia, Fredonia, NY 14063
(*Student Presentation*)

Abstract: An experiment was carried out to determine the effect of moss and soil substrates on seed germination of three common swamp tree species under varying moisture conditions. Greenhouse experiments were conducted involving Freeman's maple, American elm, and green ash, the dominant trees of Bonita Swamp in Jamestown, NY. Three hydrologic conditions of wet, moist and dry were coupled with three substrate treatments of the mosses *Hypnum imponens* and *Thuidium delicatulum* and soil. Germination was significantly higher under wetter conditions than drier. Overall germination was higher on soil than on moss for ash and elm but did not differ across substrate for maple. For all three species significant interactions occurred between substrate and hydrology illustrating that moss increases germination in wet environments and decreases germination in drier environments. Moss appeared to be beneficial to germination success in wet environments due to increased drainage and uplift of seeds above the water. The

presence of moss in drier environments suppressed germination perhaps due to increased drainage and water competition. The three trees exhibited different regeneration niche space with ash preferring the wetter environments and elm the drier environments.

Title: **In vitro studies on the conduction velocity in rat sciatic nerve following exposure to Penta BDE and Deca BDE**

Author: Charles F. Nelatury[†], Nathan Kubeldis[§] and Mary C. Vagula[§]

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(Student Presentation)

Abstract: Polybrominated diphenyl ethers or PBDEs, are synthetic organic flame retardants belonging to the brominated flame retardant super-family. PBDEs are found in an extensive array of household products, construction materials, motor vehicles, textiles, and as polymers in consumer electronic equipment. Because PBDEs are both lipophilic and extremely resilient to chemical or physical degradation, their levels in environment and humans have been increasing at an alarming rate in the past 30 years. Unfortunately, the toxicity of PBDEs is not yet fully understood. One of the immediate deleterious effects of PBDEs on humans and animals is neurotoxicity manifested by spontaneous behavioral change, learning and locomotor delay, and reduced quantity of nicotinic receptors in the hippocampus. A recent study established that neonatal exposure to a single oral dose of PBDE-99 during the brain growth spurt period disrupted normal brain development in mice. Lower brominated PBDEs have a higher potential for bioaccumulation than their poly counterparts. Thus neuro-developmental toxicity has been more significantly related to these lower brominated congeners. In our research work we experimented with penta as well as deca BDEs. Several proteins are involved in the neurodegeneration and neuroplasticity, energy production and metabolism. While biochemical studies directly determine these alterations, electrophysiological measurements confirm them in an indirect way. This paper presents the neurotoxic effects of PBDEs on some physiological properties of nerve impulses, such as nerve threshold voltage, maximum compound action potential amplitudes, refractory period, and conduction velocity in an isolated rat sciatic nerve exposed to penta and deca BDEs.

Key words: PBDE toxicity, neurotoxicity, nerve conduction velocity.

Title: **Effect of Invasive Plants on Stopover Habitat Quality for Songbirds**

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Abstract: Stopover habitat is essential to migrating songbirds, and is particularly important in areas where bottlenecks or barriers occur, such as coastal shorelines and peninsulas. Yet these areas often are severely impacted by human influences, including the presence of invasive plant species. Large amounts of invasive plants may be indicative of poor habitat quality, providing insufficient foraging opportunities for migrants. We banded birds at Presque Isle State Park, Erie, Pennsylvania, along the southern shore of Lake Erie, at three sites with differing levels of invasive plant species during fall migration of 2008 (about 1600 birds captured) and spring migration of 2009. We found that most bird species at most sites did not show significant weight gains during stopover. This is an ongoing study and we plan to make future habitat management recommendations based on this work.