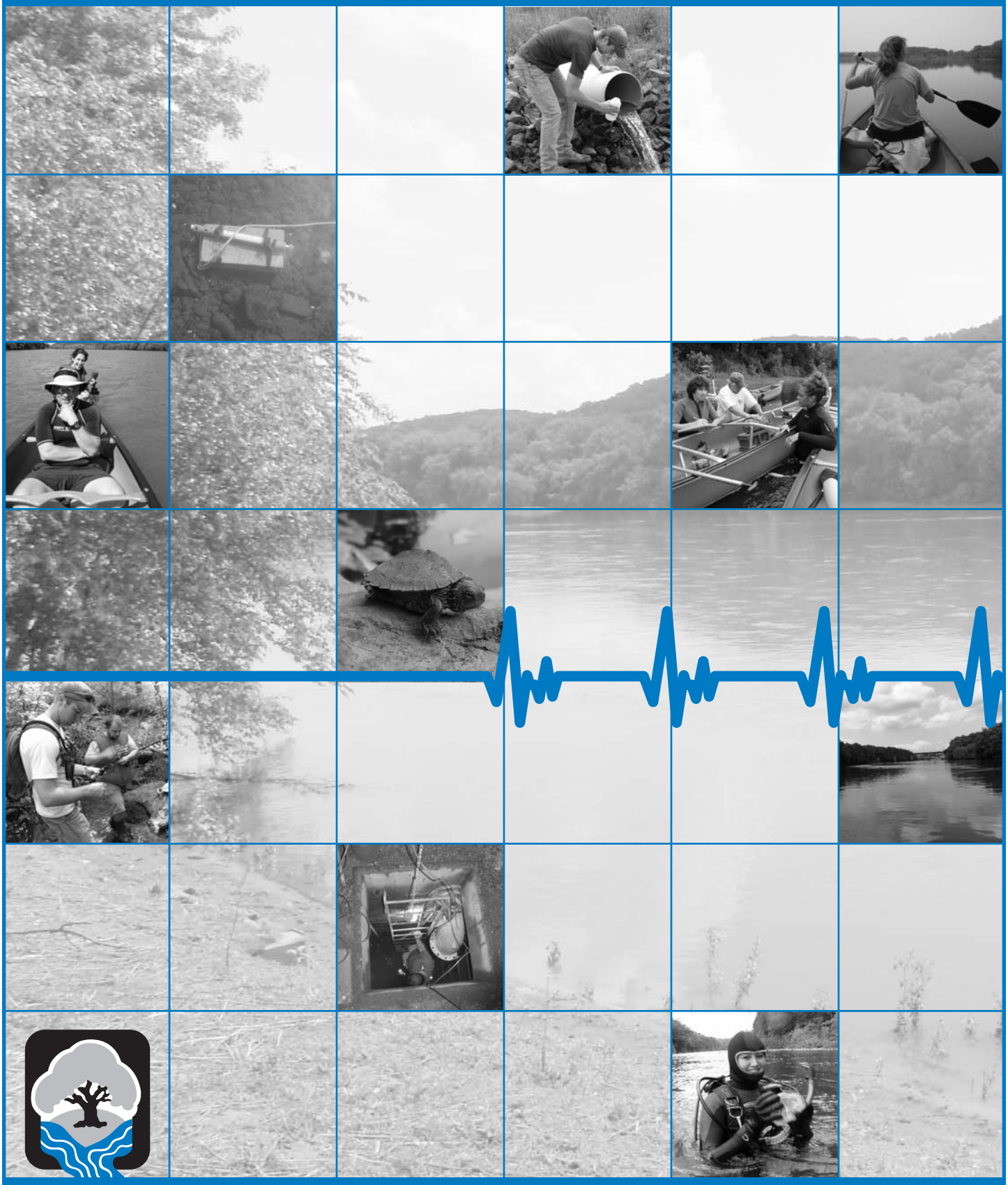
pulse of the heartland 2009 annual report



presented by the SRHCES

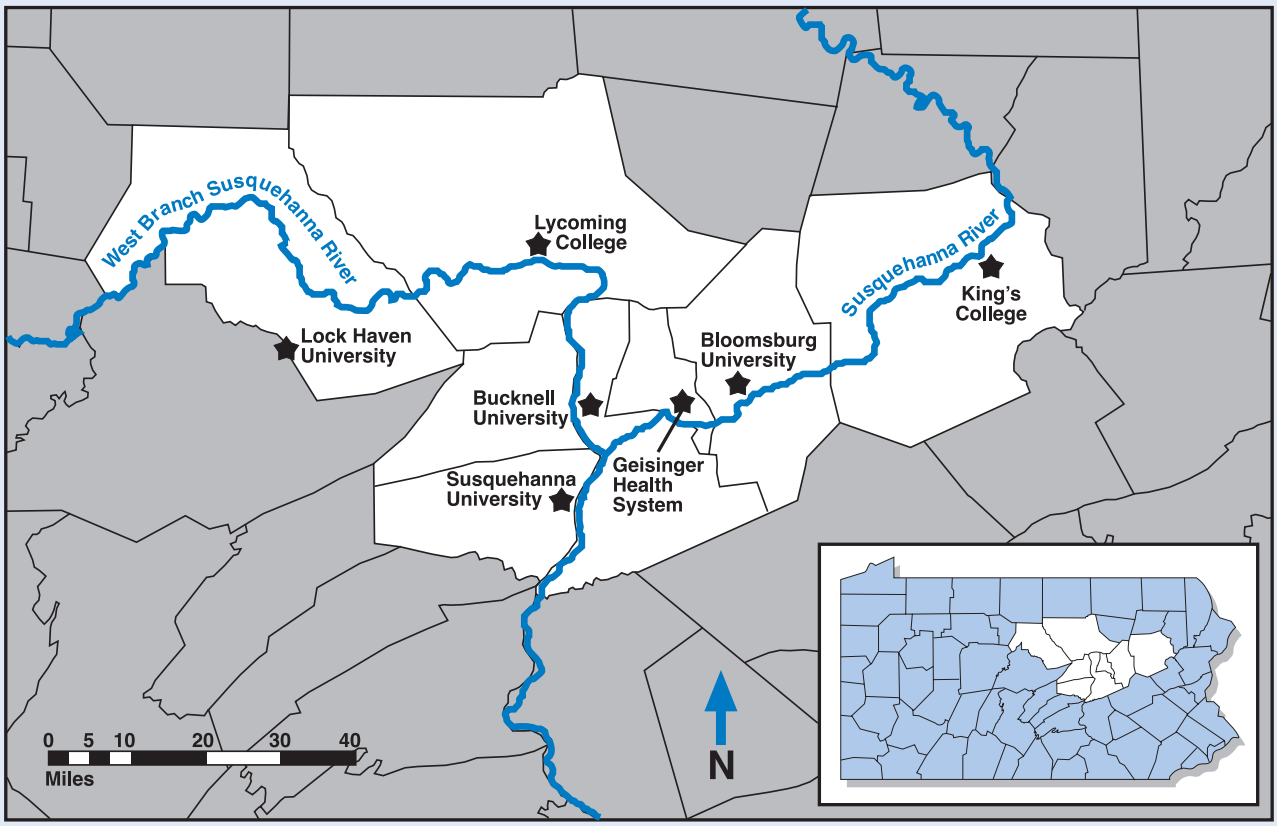
Susquehanna River Heartland Coalition for Environmental Studies

SUSQUEHANNA RIVER HEARTLAND COALITION FOR ENVIRONMENTAL STUDIES

The Susquehanna River and the watershed it encompasses is arguably this region's most important asset in defining the quality of life for all who live, work and play within its boundaries. Providing half of the fresh water that reaches the Chesapeake Bay, the influence of the Susquehanna River extends beyond Pennsylvania to the lives of many within the Chesapeake Bay area.

Recognizing this tremendous asset, six years ago six regional colleges and universities joined other partners including ***Geisinger Health System***, ***Trout Unlimited***, ***Northcentral Pennsylvania Conservancy***, *the* ***Forum for Pennsylvania's Heartland, Foundation for Pennsylvania's Watersheds*** *and* ***SEDA-COG*** *to work with state agencies and Chesapeake Bay affiliates to form the Susquehanna River Heartland Coalition for Environmental Studies (SRHCES). Through the Coalition the faculty and staff's impressive talents are engaged to address environmental issues within the watershed. Additional promotion and support for this effort has come from sponsors such as* ***WVIA*** *(Northeastern PA's public broadcasting station),* ***Sunbury Broadcasting Co.***, ***The Daily Item***, *and the* ***Degenstein Foundation***.

Included in this report, you will find summaries of the projects and activities within the various fields that SRHCES has become involved. Additionally, you will find updates on our partner the Nature and Human Communities Initiative, the efforts of WVIA and Sunbury Broadcasting, and an update on the abandoned mine legislation discussed in the 2007 Report.



For more information about SRHCES, please visit www.SRHCES.org.

Map provided courtesy of Jeff Brunskill, Department of Geography & Geosciences, Bloomsburg University

Monitoring the Susquehanna

This summer, the Susquehanna River Heartland Coalition for Environmental Studies began a collaborative project involving faculty and students from Bloomsburg University (Dr. Steve Rier, Dr. Cynthia Venn, Dr. Chris Hallen), Bucknell University (Dr. Matt McTammany, Dr. Ben Hayes, Dr. Craig Kochel), King's College (Dr. Brian Mangan), Lycoming College (Dr. Mel Zimmerman), and Susquehanna University (Dr. Jack Holt, Dr. Ahmed Lachhab, Mike Bilger). Each college and university is primarily responsible for some component of the research, but many members gather similar data. The project is to study water quality, water chemistry, and biota (algae, bentic invertebrates, fish, etc.) in the Susquehanna River in Central Pennsylvania in conjunction with the Susquehanna River Basin Commission (SRBC). Primary sites include the locations of two stationary sondes (water quality measuring devices) on the West Branch in Milton and in the north branch near Danville, as well as below the confluence near Hummels Wharf/Selinsgrove. The Heartland Coalition scientists will be pulling information to create a snapshot at water quality on a regional scale (rather than focusing on a certain stream or part of the River as a whole), hoping to identify potential threats as an early warning system. On a personal level, this research will expose students to the group as a whole and also help with contact and forging a new relationship with the water companies at Milton and Danville (where two of the sondes are located).

In addition to this collaborative effort, the Susquehanna River Heartland Coalition for Environmental Studies conducts many studies on the ecology of the Susquehanna River and its surrounding environment. Currently, the group has research projects at the PPL Montour Preserve, on Shamokin Creek, in Montandon Marsh and other locations throughout the Susquehanna River drainage. The majority of the Heartland Coalition is focusing on gathering data on the different parameters for the Susquehanna River Assessment. Below you will read more about various research that has been conducted by university representatives within the coalition, but it by no means represents all of the work being done.

For further information, please visit www.srhces.org.

MATT MCTAMMANY

Assistant Professor of Biology and Environmental Studies

Professor McTammany's main research this summer consists of studying patterns of oxygen concentration to calculate rates of photosynthesis and respiration at specific locations in the Susquehanna River. He does this by measuring levels of dissolved oxygen within the water channel, a variable which changes because of both biological processes (photosynthesis and respiration) and the exchange of gas with the atmosphere (what is called reaeration). Reaeration is related to turbulence and water temperature – higher turbulence means water is exposed to the atmosphere more while cold water tends to hold more dissolved gases (high concentrations of oxygen). This is especially important when Dr. McTammany manually tests river at certain sites because water near the river bank have more change in temperature than the middle of the river (making dissolved oxygen measurements more variable along the sides of the waterway). The ecological reasons for this type of study relate to energy and food: oxygen is required for respiration but is produced by photosynthesis. Dr. McTammany calls this give and take, the balance of photosynthesis and respiration, "ecosystem metabolism."

The ecosystem metabolism of the Susquehanna River can be affected by multiple variables. Turbidity, a cloudiness in the water, caused by sediment, iron precipitates, sewage effluent, etc. can limit the growth of algae in the River by absorbing light required for photosynthesis. Professor McTammany will also be studying how humans influence the processes associated with ecosystem metabolism, for example, by enriching the River with nutrients like nitrogen of phosphorus but possibly also increasing turbidity.

We must also again note here the work of Dr. McTammany with the Bucknell University Environmental Center and the SRHCES in which he has obtained the grants necessary to purchase the Danville, Milton, and roving sondes which will be used to measures

Dr. McTammany at work in the River

water quality conditions, including temperature, dissolved oxygen, conductivity, pH, turbidity, chlorophyll, and oxidation-reduction potential. Dr. McTammany has been instrumental in placing these water quality devices in the River and setting up a website for the real-time transmission of the collected data. Dr. McTammany can be contacted at **mmctamma@bucknell.edu**.

Lycoming College summer interns assist Mark Sausser (PA Fish and Boat Commission) on Mill Creek.

MEL ZIMMERMAN

Professor of Biology and Director of the Clean Water Institute

The Clean Water Institute at Lycoming College, under the direction of Dr. Mel Zimmerman, has been hard at work again this summer. Zimmerman and his interns are juggling river monitoring and stream restoration projects, as well as continuing a wastewater treatment project with Cromaglass Corporation, Inc. As Professor Zimmerman's research deals mostly with stream ecology and restoration, wetland ecology, and wastewater biology, he is involved with many projects this summer with his interns surveying streams in addition to the Susquehanna. Specifically, he is completing a Watershed Assessment Report for the Rose Valley/Mill Creek Watershed Association summarizing the work the Institute has conducted since 2006. His interns will also help complete a fish habitat restoration project along Mill Creek and continue to survey Rose Valley Lake as a part of this report. In other follow-up research to previous years, his interns will also be conducting surveys of Black Hole and of Antes Creek as a follow-up from a pre-monitoring project started five years ago and working closely with Dr. Peter Petokas on his Hellbender monitoring project.

In terms of research for the Heartland Coalition, the Institute focuses on the lower West Branch of the Susquehanna River watershed, continuing to survey and sample West Branch tributaries located between Lock Haven and Sunbury as well as 12 sites on the River. Dr. Zimmerman's team is responsible for collecting benthic macroinvertebrates, running water chemistry, and identifying periphyton algae as part of the River survey. The Institute will make use of the two permanent Sondes, as well as periodically testing many Benthos Rock Baskets, Hester-Dendys, and diatometers located at sites in Milton, Danville, and Selinsgrove throughout the summer. Dr. Zimmerman is also involved in a major stream restoration project at Trout Run Park (Lycoming Creek), which is on schedule to begin this summer and the CWI will be helping the US Fish and Wildlife biologists with pre-monitoring the area and then continue a post-monitoring survey (for fish, macrobenthos and water chemistry) during the Summer of 2010.

Additionally, Dr Zimmerman offered a course for local High School Biology teachers on the "Ecology of the West Branch Susquehanna River" in July. Professor Zimmerman can be reached at **zimmer@lycoming.edu**.

JACK HOLT

Professor of Biology

Dr. Jack Holt is an aquatic ecologist who studies attached diatoms (algae attached to rocks, wood, etc. within streams and rivers) and river plankton as a way of gauging water quality. Studying diatoms is useful because, as they are fixed within the moving water of a river, they can reveal change in water quality in a significant way. Because Dr. Holt is looking at communities that develop on the same substrates (what an organism lives on), the communities that he samples can be compared directly, integratively informing us about the health of the stream being studied. The diatom communities take about three weeks to mature and allow the collection of species in the community, many of which have been calibrated to specific environmental conditions. This time frame can then inform us as to some specifics of the water flowing over them during the previous three weeks. Similarly, river plankton, unlike fish, do not migrate or move very much—meaning that they can be studied in a way similar to diatoms. The Susquehanna River, especially downstream of "Lake" Augusta (the water impoundment formed by the dam at Sunbury), has a plankton community that can be seen, though the individuals are somewhat rarer than they would be in a pond or lake. Dr. Holt uses diatometers, the artificial substrate on which an algae community develops when left in the water, to study diatoms. When removed, diatometers can be used as microscope slides, allowing scientists to analyze the

algae and, in this case, determine possible pollution levels in bodies of water. Most of this work, as in ecological work of all types, will be done in the laboratory. Here, using a Scanning Electron Microscope and light microscopes, Dr. Holt's team identifies the diatoms, other algae, and other microscopic members of the attached community. With that information, they can compare the microscopic diversity from site to site in the river. Also, the microscopic communities inform us about the nature of the aquatic conditions, including the range of certain chemical-physical parameters that impacted the river during the past three weeks. Professor Holt can be contacted at **holt@susqu.edu**.

MIKE BILGER

EcoAnalysts & Research Scholar

Susquehanna University

Mike Bilger is also an aquatic ecologist who has worked at the United States Environmental Protection Agency and the US Geological Survey, but now works for EcoAnalysts, a private company centered in Moscow, Idaho. EcoAnalysts studies and assesses environmental regions and then can help plan conservation techniques or further monitoring. For years, Mike specialized in freshwater invertebrate taxonomy, systematics, and ecology, as well as assessing aquatic community composition (especially algae and insects). Mike has also worked on Superfund, a federal government program to help clean up uncontrolled hazardous wastes sites – focusing on zinc piles at the Palmerton, PA site – and is finishing up a third year of water quality study at Penn's Creek. For the Heartland Coalition, Mike is coordinator of the ecological aspects of the project (what the relationship between the various organisms of the Susquehanna River can tell us about water quality) and is helping to keep the time frame and project design on schedule. Since the Susquehanna River is large, it is hard to guess upcoming changes – they must all be in and out before the weather change in September because low water could strand samples. He will also be studying benthic invertebrates (insects that live on the bottom of waterways) as a means of determining water quality. Mike can be reached at **mbilger@ecoanalysts.com**.

Dr. Holt (stern) and Mike Bilger (bow) during field work.

Byer's Island from the South.

WORKING TOGETHER:

SUSQUEHANNA UNIVERSITY AND ECO-ANALYSTS

For both Professor Holt and Mike Bilger, their work for the Heartland Coaltion is a method study in how to study big rivers. Instead of their past work with creeks and streams, they cannot walk into the Susquehanna River and therefore have to enter this study with a new approach. They will be testing algae with diatometers, taking chemical and physical samples to help determine water quality. They will use rock baskets to test bugs/invertebrates (including stone flies, mussels, crayfish, mayflies, Dobson flies, etc.) for contaminates. Specifically looking for macro-invertebrates (anything half-millimeter or larger), the team will focus their tests for mercury but may also check for other toxins. These rock baskets will have limestone mixed into the basket and must be anchored well (they cannot be exposed above the water level, sit on the bottom, or become filled with suspended sediment). They will be deploying the rock baskets for six weeks and the diatometers for three weeks, using sites that straddle Byers Island. By triplicating data (using three rock baskets and three diatometers placed on each side of the Island) they hope to obtain successful first round results by retrieving a significant amount of artificial substrates.

Their purpose, instead of describing in great detail the communities of algae and invertebrates, is to allow those communities that develop on our artificial substrates to tell us about the nature of the river. Therefore, after taking these samples, the majority of the work will then be completed in the laboratory. In

addition, they intend to keep permanent museum samples. Once processed, the diatoms and other algae samples are examined for species identification (ie. what exactly are they looking at). After that, the samples are counted so that they can estimate relative importance in the community and estimate the diversity of the community. In addition, certain classifications (or taxa) are associated with different types of aquatic conditions (e.g. high nitrogen or high levels of sedimentation). The occurrences of these taxa suggest the nature of the river water through the period when the community was establishing itself. That is, they help to integrate major physical and chemical parameters over the 3-week (diatoms and other algae) or 6-week (benthic invertebrates) periods in which they developed.

Professor Lachhab gathering samples.

AHMED LACHHAB

Assistant Professor of Earth & Environmental Sciences

Susquehanna University

Professor Lachhab is a groundwater hydrologist who is currently working with his students on several projects involving water supply and concerns about water-depletion in the vicinity of pumping wells at Monroe Marketplace, and Modeling and Groundwater budget of Montandon wetlands. His recent participation in water monitoring of the Susquehanna River involves water quality at different sites. As a result, several transects along a stretch extending from Sunbury to Liverpool were selected. Dr Lachhab focuses on characterizing physical and chemical properties of the river which will eventually be used in a broad study involving ecological and biological components. In the current project five sites were selected downstream from the merging point at Sunbury to assess several features affecting the river. These transects include one downstream from the power plant; the second downstream from Penns Creek, and the third is located in the area of Liverpool below a network of islands to evaluate the degree of mixing at this point. Two other transects are performed to verify previous data and to investigate if there are any trends in data. Each site is represented by transects along which water analyses are performed at approximately 30 to 100 meter intervals depending on the width of the section. A Hydrolab Sonde was used to measure physical properties and the collected water samples are tested for Nitrite, Nitrate, Phosphorus, and Ammonia in the lab. Additional components such as turbidity and bathymetry are also measured to study the hydraulic affect on the distribution of sediment and mixing of nutrients in the river. The project is in progress and work is still ongoing. Dr, Lachhab can be reached at **lachhab@susqu.edu**.

STEVEN T. RIER

Associate Professor of Biology and Ecology

Bloomsburg University

Dr. Rier's research interests encompass many aspects of stream ecology but mainly focus on the role that microorganisms such as algae, bacteria, and fungi play in regulating stream ecosystem functions and how human impacts can alter these dynamics. In past years his lab investigated how impacts such as acid mine drainage from abandoned coal mines alters stream ecosystem functions such as the decomposition of organic matter and uptake and mineralization of nitrogen and phosphorus. This year he will not be working on AMD, but rather with colleagues Dr. Cynthia Venn and Dr. Chris Hallen (see below) on analyzing water chemistry in the Susquehanna River for the Heartland Coalition's survey. Dr. Rier will be running and using real-time monitoring stations at Danville and Milton, collecting real-time water quality data around the clock, while also using field probes and wet chemistry samples from three sites: Danville, Milton, and Byers Island. In many cases, these water samples will be collected by Professor Rier in bottles from his boat, taking them to the lab to be analyzed. He will specifically looking for oxygen, pH, conductivity, turbidity, temperature, heavy metals and nutrients like nitrogen

Dr. Rier installing a sonde.

and phosphorous. Through this research, Dr. Rier hopes to provide a snapshot at certain elements of water quality in the Susquehanna River in order to allow for the appropriate conservation action to be taken if necessary.

Dr. Rier will also be working in Fishing Creek, a tributary on the North Branch. Here, Professor Rier's team has investigated nutrient dynamics—how nutrients, including nitrogen and phosphorus, are processed and how short nutrient pulses might lead to drastic alterations in important ecosystem processes. Professor Rier can be contacted at **srier@bloomu.edu**.

WORKING WITH:

CYNTHIA VENN
Associate Professor of Geography & Geoscience

and

CHRISTOPHER HALLEN
Professor of Chemistry

Dr. Venn is a geo-chemist who studies the chemistry of ground and surface water, working at Bloomsburg's Institute for Environmental Analysis. She has worked with acid mine drainage and other pollutants, often in hand-on courses. Dr. Christopher Hallen, an analytical chemist will be offering equipment and help from his chemical lab. In their collaborative work with Dr. Rier, Professor Venn and Professor Hallen will be collecting and preserving samples in the field along with Professor Rier. Samples will be analyzed in the lab by Dr. Hallen and his undergraduate intern, using an ion-chromatograph to detect the different ions found in the water samples. Although it cannot detect mercury, the ion-chromatograph is able to identify multiple different ions at once (unlike wet chemistry), both anions (fluorides, bromide, chloride, nitrates) and cations (sodium, calcium, potassium, magnesium). Various metals (iron, manganese, cadmium, lead) will be analyzed using atomic absorption spectroscopy. By uncovering this information about the Susquehanna River, Dr. Venn, Dr. Hallen, and Dr. Rier will be able to characterize the chemistry of the River and how it differs at sites.

BRIAN MANGAN
Associate Professor of Environmental Science & Ecology

Dr. Brian Mangan is a river ecologist, which means that he studies the interactions that occur between organisms and the river (including humans). Over the past 27 years he has studied numerous organisms from the Susquehanna including insects, snails, clams, crayfish and fish. This summer, in conjunction with the Heartland Coalition, Professor Mangan began an investigation of the extent of mercury contamination in the river. A variety of organisms will be tested for mercury including clams, fish and crayfish. In addition, he will be testing specimens for mercury that he collected and preserved from previous years. Mangan is working with Dr. Chris Janzen of Susquehanna University's Chemistry Department, who will be performing the mercury analysis on all specimens. The purpose of this research is to establish a baseline of environmental data for mercury levels in the river and the watershed. Pennsylvania recently adopted new mercury legislation for the Commonwealth and this baseline will help researchers determine if the new laws are having the anticipated environmental outcome.

This June, Dr. Mangan also completed analysis of the 800 crayfish he collected at 11 locations in the Susquehanna last summer as part of the research funded through the Heartland Coalition. The crayfish were trapped in baited-wire traps designed and built by Mangan and his students. At each location they set 100 of these traps for crayfish, baited with canned cat food. The traps were so successful that their design was published in the ***Journal of Freshwater Ecology*** (under the title, *A Versatile and Economical Trap for Capturing Wild Crayfish*). In general, this investigation has revealed that the rusty crayfish, an invasive species from the Ohio River Drainage, is making inroads to the Susquehanna River. This is probably occurring as part of "bait-bucket introductions" by anglers in the state. One surprise, however, was the discovery of an aquatic fly that was living on the backs of some of the crayfish he collected. This fly was identified by Mike Bilger,

Crayfish in the main stem of the Susquehanna River.

another Coalition member and an aquatic biologist and macroinvertebrate expert with EcoAnalysts Inc. They are preparing a manuscript of this discovery for submission to a biological journal.

Dr. Mangan also taught a week-long graduate course for area K-12 teachers at the end of June titled, *The Susquehanna River*. This course covers the geology, geography, history, economy and ecology associated with the Susquehanna. Dr. Mangan can be reached at **BrianMangan@kings.edu**.

BEN HAYES

Director of Susquehanna River Initiative

As director of the Susquehanna River Initiative at Bucknell University, Dr. Ben Hayes oversees outreach, both in terms of the teaching of Bucknell professors and his own lectures to watershed groups, short courses, and hands-on consultation. This summer, Dr. Hayes is working on three distinct research projects. The first is a wetlands restoration and mining reclamation at the Montanden sand and gravel pit in Northumberland County. Dr. Hayes will be making a bathymetric map (a map which measures water depth at various places in a body of water) of the active gravel pit, monitoring water level gains and losses between the pit and adjacent wetland. From this, he plans to develop a reclamation plan for the owners and to beginning to re-vegetate reclaimed areas on the north end of the pit.

His second project consists in assessing stream restoration structures and streams in north central Pennsylvania. In the last decade, the surrounding ten counties have received over nine million dollars from the Department of Environmental Protection (DEP) Growing Greener grants for rock and wooden structures designed to reduce bank erosion and improve fish habitat. This study will examine structures on nine streams and quantify their efficacy. Dr. Hayes will assess these structures and whether they have been beneficial to the streams in which they are located.

Dr. Hayes' final project is for the Heartland Coalition project. He will be compiling a digital database of the hydrological, ecological, and water quality data from the Susquehanna River Basin Commission and the US Geological Survey, linking this data to a geographic information system (GIS) map and converting these to a web-based map. In the field he will work with Craig Kochel, focusing on hydrology: flooding, geomorphology, and sediment transport and deposition in the main stem of the Susquehanna River and large tributaries on the West Branch such as Lycoming, Loyalsock, and Muncy. He will especially study how the large pools and riffles in the River formed, how long they persist, what the physical habitat of the area is, and how they affect water quality and ecology. Dr. Hayes will also sample bed-load and for suspended sediment, measuring the speed of the sediment, and quantity and size of sediment transported during large flow events. Dr. Hayes can be reached at **brh010@bucknell.edu**.

CRAIG KOCHEL

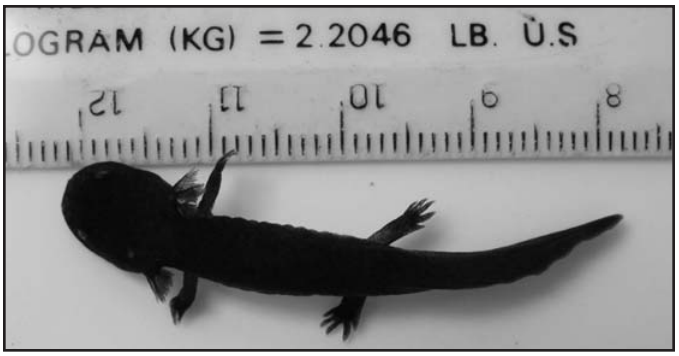
Professor of Geology

Dr. R. Craig Kochel's research interests center around geomorphology, the study of the characteristics, origin, and processes in the development and modification of landforms. Geomorphology is a very interdisciplinary field with many linkages to other areas within geology such as hydrology, hydrogeology, tectonics, sedimentology, and planetary geology; as well as other sciences such as climatology and ecology. Additionally, geomorphology provides a fundamental understanding of how earth surface processes operate and is critical in the understanding of the nature of geologic hazards.

Among these broad research areas, Professor Kochel has been focusing on the physical processes of rivers and stream restoration over the last year. In his Stream Restoration course, his students began to construct a plan for the restoration of Miller Run (the creek that goes through Bucknell University). Because of certain "abuses," this stream, which was once permanently flowing, is now of very poor quality and can be considered basically as a storm run-off ditch. One of the purposes of the class was to come up with a project to supplement the base flow of the stream, by what is called "low flow augmentation." Some of these solutions included constructing floodplain wetlands for storing storm runoff, taking out ditching, creating a more natural channel design, and reducing storm runoff.

Outside of the classroom, Dr. Kochel is starting a study of suspended sediment in the Susquehanna as a section of the watershed assessment project. Suspended sediment is the portion of the total sediment load of a river that is carried within the water column, rather than on the riverbed. He already has 17 sites and four flow gaging stations in Buffalo Creek and Professor Kochel is beginning a survey of some 30 sites throughout the Susquehanna River that will be sampled periodically during large floods. One of the questions he hopes to answer are why certain parts of the watershed yield more suspended sediment than others and how this relates to land use. A related project involves the study of coarse

gravel bedload on tributaries impacted by logging a century ago, especially in Lycoming and Muncy Creeks. Here, with the forests cut down, much more loose sediment was released into the river and is still going through the river today, resulting in major channel adjustments and changes. Although these trees were cut down decades ago, the waves of sediment take a long time to cycle through the river system, ultimately affecting water quality for those living within the river. Professor Kochel can be contacted at **kochel@bucknell.edu**.



A hellbender gilled larva.

PETER PETOKAS

Research Associate with the Clean Water Institute

For the last four years Dr. Peter Petokas has been conducting research on the Eastern Hellbender salamander in several tributaries of the West Branch of the Susquehanna River. Dr. Petokas and his student interns have been recording where they live, conditions in which they live, whether or not they are reproducing, how old they are, how big they are and how many there are. They are also conducting studies of the physical, biological, and chemical characteristics of the stream reach where a given population is living. By tagging Hellbenders with microchips, the researchers have discovered that otherwise sedentary Hellbenders will sometimes migrate and have been found as far as five miles from their original capture location.

The Eastern Hellbender is one of the largest salamanders in North America, growing up to 29 inches in length. Hellbenders are found throughout the central Appalachians in fast-flowing streams with plenty of large rocks to live under. In 1930's, Hellbenders were hunted and killed because it was believed they fed on trout and trout eggs, a misconception resulting in the decimation of Eastern Hellbender populations in many areas.

Dr. Petokas and his students have now documented the presence of amphibian Chytrid fungus in Hellbenders, a disease that is linked to the global amphibian decline crisis. Significant mortality has been observed in Eastern Hellbender populations where the disease has been documented. To help sustain populations in decline and reintroduce Hellbenders to streams where they formerly occurred, Dr. Petokas and his students are "head-starting" Hellbenders by collecting and incubating unprotected eggs, and raising the gilled larvae for later release when they are large enough to avoid most predators.

Dr. Petokas and his students provide education and outreach to elementary schools, high schools, watershed groups, sportsmen's groups, and youth groups. If you would like to report a Hellbender sighting, request more information, or schedule a presentation for a group, please email Dr. Petokas at **Petokas@lycoming.edu**.

MOHAMED KHALEQUZZAMAN

Associate Professor of Geology and Physics

Professor Mohamed Khalequzzaman, Dr. K for short, continues to broaden his research on the effects of acid mine drainage (AMD), acid deposition, and agricultural pollution within the West Branch Susquehanna River basin. His work principally involves water-quality assessment in portions of the Fishing Creek watershed, Clinton County, and the Beech Creek watershed in Clinton and Centre counties.

This field season, working cooperatively with the Beech Creek Watershed Association and the Department of Environmental Protection, Dr. K continues a three-year study addressing the effectiveness of the Avery facility, a $1.5-million-passive-treatment system constructed by the Bureau of Abandoned Mine Reclamation's (BAMR) in the eastern part of the watershed. This system collects iron- and manganese-polluted ground water and treats it by sending it through a series of lined ponds and wetlands. Treated water then moves down-gradient into the Middle Branch of Big Run, currently impacted by AMD-polluted ground water. The data collected to date indicates that although the facility does raise pH and facilitates the reduction in metals of the water it collects its effectiveness has declined slowly since it went on-line in 2006. In addition to this field component, he is undertaking lab experiments aimed at increasing the effectiveness of the treatment processes. Specifically, he is testing the interaction of limestone and mine water to determine how quickly chemical activity adds alkalinity to acid-impacted waters.

To the east of the BAMR site, two small tributaries entering the East Brach of Big Run are also impacted by

Dr. K's students collecting a water sample.

AMD, and Dr. K's team is revisiting 2006 sampling sites here in order to assess the effectiveness of artificial wetlands alone; these streams have no additional engineered remediation in their headwaters. He and his team are also sampling sites from a 2007 study conducted in the Wolf Run sub-watershed, a tributary in the western part of the Beech Creek basin. Here, his research focuses on the impact of acid deposition as it affects surface water also receiving AMD input. Finally, Dr. K continues his 7-year study of the impact of agriculture on Big Fishing Creek, where he monitors twelve sites for levels of nutrients including turbidity, phosphate, and nitrate monthly. A retired colleague, Dr. John Way, actively supports much of Dr. K's research. Dr. K can be reached at **mkhalequ@lhup.edu**.

CARLOS A. IUDICA

Assistant Professor of Biology

Susquehanna University

Professor Carlos Iudica's research interests gravitate around vertebrate ecology (living and extinct), evolution, and systematics. Unlike most of the "River Guys" sampled in this report, Dr. Iudica monitors the effect of the river on the surrounding biosphere rather the effect of the environment on the river. By studying "feeding ecology," which more or less answers the question of who is eating what, Professor Iudica and his research team are able to learn about the Susquehanna from a distance. Specifically, he is looking at the diets of different birds and animals and, in some cases, for bio-accumulation of mercury. Many of the animals in this area depend on the River for food and by studying the food chain, Dr. Iudica can track how larger animals could obtain and accumulate mercury in their bodies. His samples are processed by Susquehanna University's new mercury analyzer (a DMA-80 Direct Mercury Analyzer made by Milestone). Dr. Iudica was one of the people involved in securing this valuable piece of equipment for the University.

This research links up with his ten-year monitoring program on terrestrial vertebrates (amphibians, reptiles, and small mammals) at three sites (Shikellamy State park, Montour Preserve, and the Susquehanna University Center for Ecology, Education and Research) to generate data for a general survey and a long term ecological study on specific species. One new aspect of this study is to work on nesting boxes for mice at the Susquehanna University CEER. Dr. Iudica's team made and deployed these boxes, which currently are homes for the mice, and will periodically monitor the mice that live there. By using the nesting boxes, the mice can be observed in a less invasive way and, since babies were born there, the researchers can watch the same mice growing. Here, Professor Iudica is looking especially for long term trends, such as how a dry or wet summer could affect the mice population in different ways.

Another project that Dr. Iudica is working this summer has to do with sediments and fossil materials in caves. Analyzing samples from the Quaternary caves in central Pennsylvania, Dr. Iudica is uncovering 1-2 million year old sediments. This survey of sediment reveals glacial movement which can tell us more about climate change, temperature patterns, local extinctions etc. Additionally, the identification of fossil material from sediments allows the partial reconstruction of the vertebrate fauna from the past. By studying the shapes and dimensions of bones over time, what is called morphometrics, much can be learned about the population of the animals, including sex, size, demographics, etc. For more information, Professor Iudica can be contacted at **casaiud@susqu.edu.**

BRIAN S. SCHWARTZ, MD, MS

Director

Johns Hopkins Bloomberg School of Public Health

ZHENGMIN QIAN, MD

Director of the Environmental Health Institute

Geisinger Center for Health Research (CHR)

The Geisinger CHR and the Johns Hopkins Bloomberg School of Public Health formed the joint Environmental Health Institute (EHI) in January 2007. The EHI is engaged in large-scale epidemiologic studies in an effort to understand environmental contributors to disease causation in its 31-county catchment area. The Geisinger Clinic's 41 community practice clinics,

providing primary care services to 400,000 persons in the region, and its electronic health record provide the EHI with unique opportunities for large-scale, population-based environmental epidemiology research.

Current research projects include Ann Liu's research on evaluating associations between the burden of abandoned mine lands (AMLs) in places and measures of "community health" using Census 2000 data. Community health is being evaluated using two standards: community socioeconomic deprivation and social disorganization. The Institute has also proposed a novel strategy to explore how local environments constrain or enable the effectiveness of health care for the diabetic patient to the US National Institutes of Health. Numerous factors influence diabetes outcomes that may be beyond the reach of health care and the patient. These include the local food environment which shapes dietary behaviors (it is difficult to eat nutritiously if fresh foods are limited and the only options are fast food restaurants), the land use environment (whether the local environment facilitates physical activity), and the social environment (whether healthy behaviors can be socially shared). Jing Feng is currently examining the prevalence of childhood obesity in rural areas and will be studying similar parameters used in the diabetes study. Lastly, the Institute is characterizing environmental factors with GIS (Geographic Information Systems) mapping. In the last few decades, land use growth has far outstripped population growth in our area. In addition to noting density, diversity, clustering, etc. they researchers will also be including some of the parameters from the other study: local food and land use environments.

The Susquehanna River Assessment: What is Water Quality & How is it Studied?

As constantly changing ecosystems, rivers and streams are challenging to represent on paper. A stream's water quality can often vary from day to day, and various circumstances, such as where samples are taken across the width of the river, can often affect the outcome of a water sample. Additionally, streams are affected by everything going on around them, whether it be agricultural practices, abandoned mine drainage (AMD), sediment flows, or even high rainfall, streams are highly sensitive to all sorts of events. Since rivers and streams are very complex, the following summary provides some basic explanation about what is tested when evaluating water quality, what the ideal measurements might be, and how the different parameters are tested.

SUSPENDED SEDIMENT

According to Dr. Ben Hayes, suspended sediment is the number one pollutant in the Susquehanna River. Suspended sediment is the portion of the total sediment load (rocks, gravel, sand, etc.) that is carried with the water, rather than laying on the riverbed. It kills grass along the bank, pollutes spawning areas for much of the river fish, and blocks light required for photosynthesis. In recent years, there has been much effort exerted by conservation groups to reduce bank erosion and sediments trapped behind old historic mill dams. Scientists Dr. Hayes and Dr. Kochel explain that not all sediments come from the bank, in fact, much of the sand and gravel in upland areas are relics of historic logging. These sediments move as pulses through watersheds, making their way down to larger tributaries and even the main stem of the Susquehanna River. As a result, bridges and stream restoration structures are being buried or eroded and the streams remain in a prolonged state of disequilibrium. As of 2009, sufficient data on suspended sediment or bedload has not yet been collected to determine its full effect on water quality.

HOW THEY STUDY IT:

Scientists use a Helley-Smith bedload transport to measure bed-load (coarser gravel and sand sized particles being washed along the bed of the river) and D48 and P61 suspended sediment samplers to collect suspended sediment. These devices, shaped something like torpedoes, are attached to a strong wire crank mounted to a structure like a bridge. The sampler will then be lowered into the water to the specific depth required (if testing for suspended sediment the sampler will be closer to the top of the river) and then the sampler will open, beginning to collect the sediment. Sediment loads can be variable however, so it must be test multiple times from separate locations for greater certainty.

TURBIDITY

Turbidity, a measure of cloudiness in the water, caused by sediment, iron precipitates, sewage effluent, plankton, etc. causes light to be scattered or absorbed rather than passed on straight into the waterway. When light is blocked from fully entering a waterway, water plants and algae growth can suffer. If levels of light are

SIDEBAR

Dr. McTammany and Dr. Rier installing a sonde

Sondes

Sondes are electronic instruments with an internal computer to power sensors designed and calibrated to measure water quality parameters. The SRHCES has four sondes, two installed and two roving. The two that are installed were placed in the North Branch in Danville) and the West Branch in Milton in partnership with the Susquehanna River Basin Commission Early Warning System program. The sondes collect and send water quality data to the internet on an hourly basis (samples taken every 5 minutes). These devices measure several water quality parameters including temperature, dissolved oxygen, conductivity, pH, turbidity, chlorophyll (only ones at Milton and Danville measure chlorophyll), and oxidation reduction potential. The roving sondes measure the same water quality parameters as the "real-time" sondes (except for chlorophyll but their use is completely flexible in their placement and can be moved to focus on specific locations in the River. One of the installed and the two roving sodes were purchased from a grant to the Bucknell University Environmental Center from the U.S. Department of Education, and the installed sonde was purchased with funds from a grant to Geisinger Health Systems from a private foundation. They were placed and are currently serviced by Dr. Matt McTammany of Bucknell University and Dr. Steve Rier of Bloomsburg University. Real-time water quality data from the installed sondes is accessible at

http://www.facstaff.bucknell.edu/mmctamma/research/susquehanna/

too low, the plants will not be able to photosynthesize and will die. This can cause a problem for fish and other water organisms that require oxygen to breathe. Additionally, the causes of turbidity can poison organisms, clog the gills of fish, breed bacteria, and make it difficult for fish to feed because of reduced visibility. Turbidity can also cause the waterway to rise in temperature because the particles absorb heat from sunlight. An increase in temperature corresponds with a decrease in oxygen.

HOW THEY STUDY IT:

One way to determine water's turbidity is by using an electronic turbidimeter. The turbidimeter uses a light source and a photoelectric cell to measure the light scattered by suspended particles in a water sample. The results are measured in Nephelometric Turbidity Units (NTU). The sondes also test for turbidity.

DISSOLVED OXYGEN

Dissolved oxygen is the oxygen available in the water for the aquatic organisms to breathe. This is one of the most necessary parameters in a waterway because of how many organisms require oxygen for survival. Oxygen is diffused into the water from air, by fast moving waters, and as a byproduct of photosynthesis. The more the water moves, the higher the oxygen level will be. Typically, waterways with large amounts of organic decay (especially due to an influx of nutrients) have low levels of dissolved oxygen. However, though large growth of surface algae and plants temporarily increases dissolved oxygen, this oxygen is concentrated at the surface and deeper waters may have a low amount of dissolved oxygen. If oxygen levels remain below one or two milligrams per liter of water for just a few hours, many fish can die. Although good oxygen levels are often challenging to pinpoint since oxygen levels fluctuate naturally between day and night, generally good oxygen levels fall around 7 mg/L or higher. The Danville and Milton sondes reports mean dissolved oxygen levels around 9 mg/L during the month of July.

HOW THEY STUDY IT:

There are multiple ways to test for dissolved oxygen. One is the Winkler method, which takes a water sample and adds different, colored chemical solutions. At the end of the steps, scientists can calculate the amount of dissolved oxygen. Another method is using a YSI oxygen probe which absorbs oxygen in order to determine the dissolved oxygen content. The sondes also test for dissolved oxygen.

NUTRIENTS (NITROGEN & PHOSPHORUS)

Nitrogen is found naturally in the environment and is an essential nutrient to plant life. Nitrogen most commonly comes in three forms: nitrite, nitrate, and ammonium. Nitrate is the most significant in terms of water quality because, as a major fertilizer ingredient, it is used on crops and lawns. Additionally, nitrates can be found in municipal and animal wastes. Although essential to plant life, high concentrations can increase plant and plankton growth that ultimately disrupt the water ecosystem. When the algae or plankton populations grow too wildly, overall oxygen levels become severely depleted. When consumed, nitrates can become nitrites, which are very harmful and destroy the ability of blood cells to transport oxygen. Generally, healthy nitrogen levels should be around 0.5 milligrams per liter of water (0.5 mg/L) or less.

Phosphorus, like nitrogen, is a nutrient naturally present in the environment. But when found in high concentrations, phosphate can disrupt the natural ecosystem by increasing the growth of algae, water plants, and plankton which provide food for fish. Some sources of high phosphorus concentrations include detergents and municipal fertilizer run-off. For human beings, consuming too much phosphorus can lead to digestive problems. Healthy phosphorus levels generally fall below 0.05 mg/L.

When there is an excess of these nutrients in the water, a condition known as “eutrophication” occurs. Eutrophication means that there is an increase in chemical nutrients to a degree which is unhealthy for the body of water. When an excess of nutrients enters the waterway, algae, aquatic plants, and plankton will grow wildly. The plants will then choke up the waterway and use up large amounts of oxygen. This rapid growth of aquatic plants will eventually die and, with its decay, uses up more oxygen – ultimately lowering dissolved oxygen levels in the water.

HOW THEY STUDY IT:

A variety of procedures can be used to test for nutrients in the waterway with varying degrees of accuracy. For imprecise measurements, there are many nutrient testing kits which use strips placed into the water to determine the concentration of nitrogen or phosphorus. Wet chemistry is a much more exact way to measure nutrients in the water. Here, scientists will take samples to the lab, conducting tests on the water sample to measure nutrient content. Another method of testing for nutrients is using an ion-chromatograph to detect the different ions found in the water samples. By determining certain concentrations of ions, the scientist can measure the level of nutrients in the water.

A Lycoming College intern preparing to dive during sampling.

DIATOMS (AND CHLOROPHYLL)

Diatoms are single-celled algae that live on rocks or plants in a waterway and are able to photosynthesize. Diatoms have become an important measure of water quality in the last twenty years. As diatoms are stationary, they can be used to accurately understand a certain, specific body of water. Water quality variables, such as an influx of nutrients or pH, influence growth or decline of a community. By seeing how much is growing, as well as what chemicals, nutrients, etc. are in the algae, scientists can use the diatoms as a measure of water quality. Also the way that diatoms are studied allows for comparative analysis between samples to determine with great accuracy the parameters studied in the waterway.

HOW THEY STUDY IT:

Diatoms are studied with a diatometer, the artificial substrate on which an algae community will develop. The diatometer, which is left in the waterway for about three weeks, allows scientists to study algae that colonize on the instrument. The diatometer is also a structure which allows a set of microscope slides to be exposed to water. The communities grow directly on microscope slides which, when removed from water, can be treated to make a permanent slide of the community. After being preserved as a slide, scientists can use microscopes to further identify and study algae on the slide. Additionally, a measure of chlorophyll (ug/L) is taken by the sondes by taking a measure of algae in the water column.

BENTHIC INVERTEBRATES

Benthic invertebrates are insects and other small animals that live on the bottom of different waterways.

Interns preparing rock baskets for placement in the river.

Benthic invertebrates recycle organic matter in the water and are a significant part of the food chain for many fish. By collecting and determining the species that are living in the water, the condition of the water can be gauged. For example, various insects can show a whole range of tolerances to fluctuations in the environment; if a particularly sensitive insect (one that shows low tolerance to many changes) is discovered at a given location, this can be an indicator of good water quality. Benthic invertebrates are directly affected by changes in water quality and, generally, do not move or migrate—stably staying where they live for their life cycle. The Hillsenhoff Biotic Index produces a score between 0 (Excellent water quality) and 10 (severe pollution) by assigning each species a pollution tolerance score. Using the number of each species found in a specific location, the overall score is calculated using the Biotic Index Formula. The ideal score is 3.75 or lower.

HOW THEY STUDY IT:

Benthic invertebrates are collected in benthos rock baskets, an artificial substrate composed of a basket filled with rocks. In the SRBC study, rock baskets will have limestone mixed in and must be anchored well (they cannot be exposed, on the bottom, or filled with sediment). The rock baskets simulate an environment in which the benthic invertebrates would live and, left in the water for six weeks, they begin to amass life upon them. Another collection device is the Hester-Dendy multi-plate sampler. These artificial substrate samplers consist of circular or square discs that are vertically stacked with spaces in between each disc. Left in the water for a certain amount of time, benthic invertebrates would begin to live on the plates. After collection, samples have to be processed for examination. Scientists use Scanning Electron Microscopes and light microscopes to both identify small invertebrates and check the invertebrates for chemicals like mercury.

CONDUCTIVITY

Conductivity is the water's measured ability to pass an electrical current and is affected by the quantity of total dissolved solids (TDS), often dissolved chemicals or salts, in the water. These dissolved solids directly correlate with the total amount of dissolved ions in the water. Anions (chloride, nitrate, sulfate, and phosphate) carry a negative charge and cations (sodium, magnesium, calcium, iron, and aluminum) carry a positive charge. Ions of inorganic dissolved solids directly affect conductivity because they can carry an electric charge well. Thus, if test results show a change in conductivity that may mean there has been a change in the amount of TDS in the water. Many sources of TDS are natural; however, municipal run-off and wastewaters can increase the amount of TDS beyond healthy levels. Conductivity is measured in micromhos per centimeter (_mhos/cm) or microSiemens per centimeter (_S/cm). A healthy conductivity rate for inland streams and rivers falls around 500 _S/cm or less. The Danville sonde measures a mean 267 _S/cm and the Milton sonde about 250 _S/cm in the month of July.

HOW THEY STUDY IT:

Conductivity can be measured with a conductivity meter and probe immersed in water. A voltage is applied to the probe and it measures the resistance of the water to calculate conductivity per centimeter. Conductivity can be measured in the waterway or in the lab via a sample. The sondes are also equipped to measure conductivity.

pH

Although pH measures acidity in the water, it also indicates a waterway's balancing act between acidic and basic, or between positive and negative hydrogen ions. The pH scale runs from 0 (strongly acidic, high concentration of positive hydrogen ions) to 14 (strongly basic, high concentration of negative hydrogen ions). Despite the negative connotation of the word "acidic," a waterway wants to strike a balance between having too many or too little positive hydrogen ions. In fact, ideal pH generally falls between six and eight in an aquatic environment. If the pH is too far at either end of the spectrum, fish will avoid the waterway or die, eggs can become deformed, algae cannot grow as well, etc. pH can be affected by many different sources including contaminated run-off and AMD. The pH can differ dramatically from day to day, or even at different times throughout the same day, largely as a result of photosynthesis. In the month of July, both sondes report pH levels at around 7.75-8 mean average.

HOW THEY STUDY IT:

A range of methods can be used to determine pH levels. Test strips are an easy and less precise indicator which often changes color to determine pH level. In the laboratory, devices like a computer aided titrimeter (CAT) can be used find pH. In the case of the Heartland Coalition work, the sondes are able to read pH.

ALKALINITY

Alkalinity is the water's ability to resist changes in pH. This is a natural phenomenon, but often with the addition of pollutants, water systems are less capable of balancing the pH and keeping waterways healthy. Since alkalinity can create a sort of buffer against various forms of acidic pollution, the higher the alkalinity the more resistant the stream might be to external influences like acid rain. Many rocks, especially limestone, are sources of natural alkalinity. If water can neutralize acids, the buffering capacity of alkalinity would give stability to the pH of a waterway necessary for fish, plant life, and other organisms to live. Affective alkalinity levels usually begin around 20 mg/L and higher.

HOW THEY STUDY IT:

Alkalinity can be measured using various commercial test kits – especially ones using dissolving tablets. However, a more scientific way involves using a pH electrode and a titrant solution. By using "titration," the unknown concentration of a known reactant can be found.

MERCURY

Mercury contamination in the water supply is becoming an increasing health concern. In the Susquehanna River basin alone, 35 different locations are under guidelines from the Pennsylvania Fish & Boat Commission limiting consumption of aquatic species, four of which are within the heartland region. In humans, when mercury accumulates beyond a certain level it can potentially damage the brain or inhibit brain development, especially during fetal growth and childhood. Dissolved mercury in the water is absorbed by aquatic species over time and can be passed on when the animal is consumed. This "bio-accumulation" works up the food chain, making larger organisms highly polluted. Mercury cannot be removed from fish by cleaning or cooking, making it persistent regardless of preparation.

HOW THEY STUDY IT:

There are many at-home mercury analyzer tests for those who want to test their drinking water. Scientists mainly use wet chemistry methods to test the water directly. Mercury, however, is most often studied by testing animals, fish, or other organisms that are a part of the waterway's food chain. Even organisms like macro-invertebrates can be tested for mercury poisoning. Additionally, Heartland Coalitions scientists will profit by using Susquehanna University's new DMA-80 Direct Mercury Analyzer made by Milestone.

COLIFORM BACTERIA

Coliform bacteria are present in digestive tracts and, consequently, fecal matter of all animals, including humans. Coliforms appear naturally in low amounts in low-flowing water. High concentrations, however, are often signs of municipal wastewater, dumping or septic contamination. These organisms can carry waterborne diseases or viruses, being a potential health risk for humans. For primary contact with water (ie. swimming) coliform concentration cannot exceed 200 coliforms per 100 milliliters (ml) and primary drinking water must report 0 coliforms per 100 ml. Natural contamination usually lies under the 200 coliforms per 100 ml level but if it is over this level there is a much greater chance that pathogenic (disease causing) organisms are present.

HOW THEY STUDY IT:

Coliform Bacteria is most often studied using "membrane filtration"—a method which filters out the microorganisms from the water. The mircroorganisms can then be cultivated so that the coliforms can grow larger in order to be better studied but the other organisms suppressed.

Communities & Culture

The Nature and Human Communities Initiative is a partner to the Susquehanna River Heartland Coalition for Environmental Studies. The researchers and practioners in the Initiative study the human stories and history of the River Valley. Together the two partners form the Susquehanna Colloquium and are working on developing multi-media "Stories of the Susquehanna Valley," to help document and share the region's cultural and environmental heritage.

SEDA-COG

SEDA-Council of Governments (SEDA-COG), is a member of both SRHCES and the Nature and Human Communities Initiative. Staff within the Community Resource Center are working in two key areas:

- **Revitalizing River Towns**
  Brian Auman and Alison Stevenson are continuing their work "revitalizing river towns" as a part of the Susquehanna Greenway Initiative. As community planners, Brian and Alison work to revitalize regional and local communities in this initiative. Working with towns in the heartland region, they are developing experiential narratives and themes that emphasize what makes each place unique.

- **Heritage Areas**
  Brian and Alison are also now working on developing "heritage areas." There are many heritage areas in Pennsylvania, focused especially around past industrial areas, but there is a big gap around the confluence area. They propose a heritage area encompassing the following counties: Union, Montour, Snyder, Northumberland, and Columbia. This project has begun with a feasibility study, which will then lead into management action plans.

WATERSHED: A JOURNAL OF THE SUSQUEHANNA

Supported by a grant from the Degenstein Foundation, ***Watershed: A Journal of the Susquehanna*** is an annual collection of poetry, fiction and artwork inspired by the people and landscape of the watershed region, including parts of upstate New York, most of Pennsylvania and Maryland. Edited by Jerry Wemple, associate professor of English at Bloomsburg University, the journal provides a space for narratives about the region. The journal debuted last fall and will be available again this fall. To submit, please contact Jerry Wemple at **jwemple@bloomu.edu**.

JOHN SMITH CONNECTOR TRAIL

Professor Katie Faull and Professor Alf Siewers are also leading a group of colleagues and student researchers on a project which aims to establish the Susquehanna River as a connector waterway trail to Captain John Smith Chesapeake National Historic Trail. The act which legally designates the John Smith Trail authorizes the creation of connecting or side trails as components of the principal trail. The feasibility study enumerates three primary purposes of the connector trails: that the trail commemorates the voyages of exploration of Captain John Smith in 1607-1609, recognizes the American Indian towns and cultures of the 17th-Century Chesapeake, call attention to the natural history of the Bay (both historic and contemporary). The research is being conducted for the National Park Service, the Conservation Fund, the Mellon Foundation, and The Friends of the John Smith Trail.

Professor Alf Siewers oversaw two Bucknell students working on sites along the lower Susquehanna. Joey McMullen researched the petroglyphs and Susquehannock settlements including the Washington Boro site and Conestoga. Jenny Stevens studied Conoy Town, Paxtang, and a Nanticoke town at the mouth of the Juniata. Molly Clay worked with Professor Katie Faull on the confluence area. Emily Bitley, under the supervision of Professor Ben Marsh, worked on GIS maps of the whole area of the Susquehanna being studied. The multi-faceted project also has collaborative components with colleagues at Bloomsburg University and SUNY Buffalo. At Bloomsburg, Professor Dave Minderhout is working with Jessica Dowsett on the upper Susquehanna from the confluence to the New York border, narrowing in especially on Spanish Hill. At the University of Buffalo, Ph.D. student Mary Kohler is researching the Susquehanna in New York State. For further information, contact Professor Faull at **faull@bucknell.edu** or Professor Siewers at **asiewers@bucknell.edu**.

KATIE FAULL

Professor of German & Humanities

Bucknell UNIVERSITY

This summer, Professor Katie Faull was awarded a $100,000 dollar NEH (National Endowment for the Humanities) grant for this coming year. Her project consists of the transcription, translation, annotation and submission for publication of the vitally

important manuscripts that constitute the Moravian mission diary of the strategic Native American "capital" of the 18th century woodlands Indians at Shamokin, Pennsylvania. The edition will also include a substantial critical introduction, which discusses the context and significance of the diary. This collection of manuscripts (written primarily in German with a few sections in English) was written by 10 different missionaries, including the young David Zeisberger, perhaps the most famous observer of Native American life before John Heckewelder (the source for Fenimore Cooper's Leatherstocking Tales).

The importance of the Moravian mission diary to studies of Colonial history, ethnography, missiology, and micro-histories of specific communities has recently become paramount in the re-examination of the relationship between ethnography and missiology, and of course within the resurgent field of Native American Studies. Such translations of mission communities have made available to scholars as yet untapped primary sources on the contact period in North America. However, the Shamokin Moravian diary differs substantially from these published mission diaries in that Shamokin itself was not a mission settlement built by the Moravians but rather preexisted their advent by several centuries, first as a Susquehannock, then Shawnee, and then in the early 18th century as a primarily Delaware settlement and trading post, overseen by the Iroquois vice-regent, the Oneida Chief Shikellamy. Professor Faull can be reached at **faull@bucknell.edu**.

THE SUSQUEHANNA VALLEY SUMMER WRITERS INSTITUTE

This year saw a successful pilot program for a Susquehanna Writers Institute long-envisioned by the Susquehanna Colloquium and the Bucknell Environmental Center's Nature and Human Communities Initiative, and funded by a grant from the John Ben Snow Trust. Students worked on non-fiction, poetry and fiction writing while exploring the history, communities and natural environment of the Valley for two intensive weeks of work that included trips to Lake Otsego and Cooperstown in New York, and along routes of the Underground Railroad. Six students and three primary faculty members based at Bucknell, together with other assisting faculty and staff from Bucknell, Susquehanna and SUNY Oneonta, and community members, participated in a program designed to develop a curriculum for a Susquehanna environmental humanities and community studies course, and for future institutes that could include area teachers. Content material for online narrative "mapping' of the valley was also developed. Thematic units of the course included examination of writings of Moravian Christians in eighteenth-century interactions with Native Americans at the confluence, as well as writings of James Fenimore and Susan Cooper based around the river's headwaters, and Toni Morrison's fiction set in the Mid-Susquehanna Valley and related African-American history in the region. Bucknell English Professor Carmen Gillespie (who is also executive director of the Toni Morrison Society, which co-sponsored the Institute) supervised students as they mapped the Danville and Susquehanna Valley references in Song of Solomon and will help to puzzle out the narrative of Charles Bell, a runaway slave and long-time employee of Bucknell to whom the Toni Morrison Society hopes to present a posthumous degree at next year's graduation ceremony. Prof. Gillespie noted afterwards that Morrison's literary interest in the region, coupled with the history of the Underground Railroad in the Susquehanna Valley, make the partnership with the Bucknell University Nature and Human Communities Initiative and the Colloquium "one with great potential for the continuation of this and other projects now and in the future." Humanities Prof. Katie Faull supervised the Institute's accompanying focus on the Moravian-Indian community of Old Shamokin at the confluence, and Associate English Prof. Alf Siewers supervised its focus on the Coopers. It's hoped that this collaboration will extend to a planned cross-media, cross-disciplinary "Stories of the Susquehanna Valley" coordinated by NHCI and the Colloquium in partnership with other programs and institutions. For a portfolio of student writings, see **http://www.bucknell.edu/x50339.xml**.

4TH ANNUAL SUSQUEHANNA RIVER SYMPOSIUM

Bucknell University will host the Fourth Annual Susquehanna River Symposium on Friday, September 25 and Saturday, September 26. This year's theme is "Cultures at the Confluence: Native Americans, Ecology, and the Susquehanna Valley." The symposium will highlight the river's impact on the culture and lives of the people living near it and examine the ways in which the past and present converge in the Susquehanna Valley. It will feature a keynote address by award-winning Chickasaw poet and novelist Linda Hogan, beginning at 6:30pm on Friday, as well as a series of panels on Friday and Saturday on such topics as Native American traditions and views of nature, and the unique characteristics of the "river towns" of the Susquehanna Valley. WVIA will also premiere the documentary "Hearth and Harvest", examining agriculture's crucial role in the

history of Pennsylvania and analyzing the current issues that face farmers, at 8:00pm on Friday in the Campus Theatre in downtown Lewisburg.

ED SLAVISHAK

Associate Professor of History

Susquehanna University

Professor Slavishak continues archival research on the photography of the Appalachian Mountains in the twentieth century. This will culminate in the publication of his second book, ***Photo Ops: Landscape and History in the Appalachians***. The project combines environmental and cultural history to consider American notions of wasteland, isolation, and wildness. During the summer, he advised an SU history major, Dakota Gessner (of Mifflinburg, PA), in an internship to create an online historical tour of Selinsgrove. The website, "Exploring Selinsgrove: History on the Susquehanna River," launches in the Fall of 2009 and emphasizes the economic and cultural life of a quintessential river town. Slavishak is also co-host of the October 2010 conference of the Pennsylvania Historical Association in Selinsgrove, which will feature panels on state and local history. Professor Slavishak can be contacted at **slavishak@susqu.edu**.

Public Awareness & Education

WKOK

Newsradio 1070 WKOK

Newsradio 1070 WKOK continues to enjoy an active partnership with the SRHCES and has provided extensive news coverage of the Susquehanna River Basin and threats facing this critical watershed. In addition to the ongoing coverage of the Susquehanna River Heartland Coalition for Environmental Studies, they provided the public with updates on the Shikellamy State Park Marina building re-use project. Furthermore, hour-long Roundtable interviews have focused on the mercury threat in our environment and WKOK aired occasional news stories about the SRHCES water monitoring project.

Coverage in the summer of 2009 will include a 'state of the river' broadcast report and an update on the Northcentral Pennsylvania Conservancy. WKOK has already aired updates and interviews on this year's Susquehanna Sojourn. The award winning "Boroughs to the Bay and Beyond" reports are continuing with coverage focusing on agriculture issues, the recession's impact on the environment, the Merrill Linn Land and Waterways Conservancy 'Caring for Community' events and other topics. WKOK continues to provide an 'open mic' for all groups who are interested in providing environmental improvements and promoting wise use of land and water.

Other previous or planned topics include an extensive update with PPL, discussing new power lines, alternative fuels and nuclear power. WKOK also initiated a series of monthly presentations, in conjunction with Molesevich Environmental, entitled 'On Topic' luncheons. The luncheons are an opportunity for energy and environmental topics to be addressed in a community setting. To date, Penna. Agriculture Secretary Dennis Wolff, PennFuture CEO John Hanger (now Pennsylvania DEP Secretary) and PPL corporate spokesman Dan McCarthy have been among the guest speakers. Local news coverage has also described a planned ethanol transfer station in Point Township, Northumberland County and ongoing environmental concerns at the Pineknotter Park in Northumberland (a recreation park built on a former landfill). Mark Lawrence, program director at WKOK, was recently profiled in Susquehanna Life as one of their 'River Personalities.' Recordings and transcriptions of much of this news coverage is available at **www.wkok.com**.

WVIA

wvia

Hearth and Harvest is WVIA's latest documentary that looks at Pennsylvania's natural resources. The program follows a chronological year in the life of Pennsylvania farmers, beginning with the Farm Show in Harrisburg in January and concluding with the traditional end of the harvest season. Within this narrative structure, the documentary conveys contemporary agriculture in Pennsylvania from seed to shelf through the voices of the farmers themselves.

During visits to the featured farms, interviews are conducted to explore key agricultural concepts – from farming and conservation practices to pricing and weather concerns to leading-edge resource management and marketing strategies. Within these topics, farmers also share their insights into other important facets of farming, such as technology, biotechnology, global warming and public policy.

Supporting interviews that provide context to the farmers' remarks are with agriculture professionals at the

Pennsylvania Department of Agriculture, the United States Department of Agriculture, and Penn State University's College of Agricultural Sciences as well as with food professionals in the retail sector and with historians to help explain Pennsylvania's 300-years of farming heritage.

The documentary is slated to be released in the Fall of 2009. Visit **www.wvia.org** for more information about ***Hearth and Harvest***.

WVIA has also produced ***Looking to the River***, which explores the historical culture and development of the natural environment on the Susquehanna River. ***Expedition Susquehanna*** follows eleven high school students as they travel the length of the Susquehanna River in 30 days. In the Fall of 2007, ***Hope for Polluted Waters*** was released as a documentary about abandoned mine drainage and its impact on the river and river communities.

ABANDONED MINE LANDS FUND UPDATE

by John Dawes
Executive Director of the Foundation for Pennsylvania Watersheds

While the state of Pennsylvania is receiving funds for reclamation from this industry supported source for abandoned mine lands, there are areas of oversight which need citizen attention. The Commonwealth is to receive as much as $50m in 2010 and if taken by the state, 30% set-aside funds can be used for acid mine drainage abatement. This is an unprecedented amount for this purpose, bringing hope to communities that have been left behind because of degraded water resources.

In partnership with the Foundation for PA Watersheds, the Department of Environmental Protection and the watershed community, ten Roundtables were held around the state to determine citizen interest and thoughts on use of the 30% set-aside funding. An outcome of this process is a very credible and thoughtful document called Program Implementation Guidelines---Revised Draft July 15, 2009. Produced by the Bureau of Abandoned Mine Reclamation, this document sets forth PA's AMD Set-Aside Program Priorities and explains an initial benefit cost analysis for project selection. This document is a good step forward in making transparent, the reasons why a project is funded.

Regarding the Office of Surface Mining Reclamation and Enforcement (OSMRE), it is absolutely necessary for the nation to have a good Director. Previously, OSMRE has not provided enforcement, and has been part of a rule-making process that resulted in the elimination of the 100 ft. buffer zone for headwater streams for mining. This will allow for valley fills and miles of streams to be buried until this rule is fixed. This should be the first priority of a new Director, who is charged by the new Administration to revamp the agency.

Special thanks to the
Degenstein Foundation
for their continued support of the Susquehanna River Heartland Coalition for Environmental Studies.

The 2009 Pulse of the Heartland Report
was written by Joey McMullen
under the supervision of Dr. Alf Siewers,
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