

Pulse of the Heartland 2008

An Annual Report



Presented by the

SRHCES

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, five years ago six regional colleges and universities joined other partners, including **Geisinger Health System, Trout Unlimited, the Foundation for Pennsylvania Watersheds, Northcentral Pennsylvania Conservancy, the Forum for Pennsylvania's Heartland and SEDA-COG** to work with state agencies and Chesapeake Bay affiliates to form the **Susquehanna River Heartland Coalition for Environmental Studies (SRHCES)** and engage the impressive talents of faculty and staff 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 stations), **Sunbury Broadcasting Co.**, **The Daily Item** and the **Degenstein Foundation**.

With recent approval from DCNR, the coalition will be constructing an environmental education center at the Shikellamy Marina for members of the group to utilize for coursework and research. The center will contribute to the coalition's goal of mobilizing the scientific and student resources of colleges and universities in combination with community and regional interest groups to improve the watershed by encouraging and facilitating environmental research, analysis, advocacy and public service. Over the first five years, working with watershed associations and other advocacy groups, more than \$800,000 in projects have been undertaken, including mitigation of acid mine drainage, riparian planting projects and water quality monitoring in the river and its tributaries. This summer alone, the group supported over \$100,000 in internships to university students and approved the purchase of a mercury analyzer – to be housed at Susquehanna University – to aid in the study of mercury accumulation in fish, a major health concern. An additional outreach initiative has included providing environmental education classes for K-12 science teachers.

Furthermore, the coalition has supported humanities research such as the Heritage Area Study at SEDA-COG and the publication of the journal **Watershed**, containing original prose and poetry about the area. These efforts seek to re-define and celebrate cultural identity in central Pennsylvania, largely by returning to the Susquehanna as a source of revitalization.

Included in this report, you will find summaries of the projects and activities within the various fields that SRHCES has become involved in. Additionally, you will find extensive information regarding agricultural impacts on the Susquehanna River, the highlight of this year's Susquehanna River Symposium.

A special word of thanks goes to those six institutions of higher education (**Bloomsburg University, Bucknell University, King's College, Lock Haven University, Lycoming College and Susquehanna University**) for their commitment to the region as well as to the **Environmental Health Institute at Geisinger**.



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

Agriculture and the Susquehanna...

A Look at Farming, Water Quality & the Chesapeake Bay

Introduction

Agriculture plays a critical role in the health of Pennsylvania's communities, economy and environment. Pennsylvania's 58,000 farms are the backbone of a \$44 billion per year industry, providing about 84,300 jobs in Pennsylvania (according to the PA Department of Agriculture). Pennsylvania leads the nation in production of Christmas trees, hardwood lumber, and mushrooms. The state's agriculture is very diverse and produces large amounts of milk, beef, pork, poultry, eggs, apples, peaches, pumpkins, and a wide range of other fruits and vegetables. It plays a significant role in feeding the growing population in the mid-Atlantic region, as well as the rest of the world.

About half of Pennsylvania, including over three million acres of farm land, drains in to the Susquehanna River and ultimately the Chesapeake Bay. What happens on this land – good and bad – has a direct impact on our rivers and streams, and eventually the Bay.

The transition of Pennsylvania's landscape from historically forested to agricultural lands has critically impacted not only our terrestrial ecosystems, but also our aquatic systems as well. This land use transition overall

makes our land more susceptible to the effects of erosion and can significantly increase pollutant loads, especially sediments and nutrients, delivered to our rivers and streams through increased runoff. River and stream temperatures tend to be higher without the shade and protection offered by streamside forest canopy, which can significantly alter an ecosystem as well.

Approximately 5,320 miles of Pennsylvania streams are impaired by agricultural non-point source pollution, primarily excessive nutrients from livestock manure. Acid mine drainage and urban/suburban development account for 5,584 and 3,931 miles of impaired streams, respectively, according to the Pennsylvania Department of Environmental Protection's 2008 Integrated List of Waters.

Much of the agricultural impact on our rivers and streams can be addressed through basic changes in farming practices that can both increase farm production and protect our natural resources. Supporting agriculture and restoring our rivers and streams are not either/or decisions. Healthy, thriving farms are an essential link to clean streams and rivers. Farmers have significantly reduced agricultural pollution, while much more needs to be done to reduce pollution from **all** sources.

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An Update on Abandoned Mine Drainage and Restoration on the West Branch Susquehanna River

Last year our feature story focused on abandoned mine drainage (AMD) and its impact on water quality. As a follow-up to last year's report, here you will find a brief update on restoration efforts led by the West Branch Susquehanna Restoration Coalition (WBSRC), a group composed of watershed groups, Trout Unlimited (TU) chapters, county conservation districts, businesses and others working to address AMD problems throughout the West Branch Susquehanna River Basin.

WBSRC has recently released the West Branch Susquehanna Subbasin AMD Remediation Strategy. Developed by the Susquehanna River Basin Commission (SRBC), the strategy provides suggestions about where to focus clean-up efforts along the 1,205 miles of streams throughout the basin. The strategy includes an interactive map that shows significant discharges to be the focus of remediation efforts, as well as areas that require further monitoring and assessment.

The coalition also released an economic benefits analysis of AMD restoration. Completed by Downstream Strategies, the study suggests that external funding for AMD restoration can boost local economies. The study also looks at the impact of AMD on property value, sport fishing revenue and private and public drinking water.

On July 18-19, the coalition hosted its fourth annual West Branch Susquehanna Restoration Symposium at the Nittany Lion Inn at State College, where both of these reports were released. These reports will be made available on the West Branch Susquehanna River Coalition web site, www.wbsrc.com. Please visit the site for more information about AMD remediation and to learn how you can get involved.

Nutrient & Sediment Pollution

Soil erosion limits the productivity of farmland, and leads to sediment pollution entering streams. Sediment smothers our streambeds, destroying many functions of the stream ecosystem and choking fish spawning habitat. Sediment also blocks sunlight needed by aquatic plants that provides habitat essential for fish and other aquatic animals.

Two key nutrients – nitrogen and phosphorus – are needed by all living things, whether plants, animals or microorganisms, to grow and survive. They occur naturally in soil, water and air, and accumulate in plant materials. Humans and animals also excrete nutrients that can be used as a fertilizer for crops and other plants.

Excess nutrients in our waterways cause significant pollution. Nutrients find their way into waterways through a variety of processes. Many sewage treatment plants and industrial facilities discharge nutrients directly into a stream, and are identified as “point sources.”

Nutrient pollution also comes from many different sources that cannot be easily identified, so are called “non-point sources.” For example, nutrients are a component of many forms of air pollution, such as vehicle exhaust and industrial emissions, and eventually come back down to the ground. Nutrients on the land, such as these deposited air emissions, as well as lawn and crop fertilizers and livestock manure, can be transported to local streams during each rainfall.

Whatever the source of the nutrients, they flow with the water and can affect downstream water bodies along the way. Nutrients have always been an essential part of these waters. If they occur at excessive levels, however, they fuel the growth of vast quantities of algae that throw these ecosystems out of balance. Large “blooms” of algae block sunlight from reaching underwater grasses that provide vital habitat and food sources for fish and other wildlife. Their decomposition depletes oxygen in the water, which is essential for these same animals, and leads to “dead zones” or areas void of almost all life.

Significant reductions of nutrient and sediment pollution are necessary for Pennsylvania’s rivers and streams, and for the Chesapeake Bay that receives these waters, to once become healthy ecosystems with thriving fish and wildlife populations. Although phosphorus is more problematic in fresh water, nitrogen is more significant to the brackish Chesapeake Bay waters.

Large reductions in the Susquehanna River’s nutrient pollution are required by the federal Clean Water Act. In Pennsylvania, the majority of the effort is focused on addressing nutrients from agriculture and sewage treatment plants.

Agriculture’s Role in Reducing Nutrient and Sediment Pollution

Pennsylvania’s contributions, relative to other states, to the Chesapeake Bay are significant: 40% of the nitrogen, 19% of the phosphorus, and 23% of the sediment. Of Pennsylvania’s contribution, agriculture is responsible for 48% of nitrogen, 59% of phosphorus, and 73% of sediment.

Integrated crop and livestock production usually is a well-balanced cycle,



Marginal land is used for rotational grazing at Harmony Springs Farm in New Berlin.



Streambank fencing keeps the cows (and their manure) out of the streams. At Mapes View Farm in New Berlin, the streambank fence is hidden within the grassy riparian buffer protecting the stream.



No-till farming is a low-impact method of farming that does not include plowing. Therefore, you can often still see last season's crops in the lanes between this season's crops. This photo was taken at Harmony Springs Farm where about 90% of the farming is done with the no-till method.



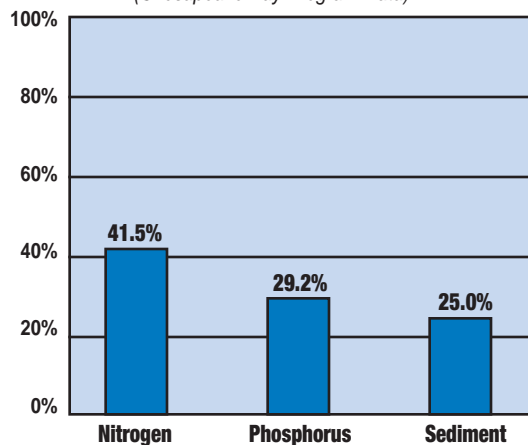
Heavy tanks such as this one transport manure to the fields to be spread as fertilizer.

with the manure providing the nutrients needed by the crops that feed the livestock, and with both crops and livestock feeding people. Pennsylvania's agriculture has experienced industrialization and specialization since World War II, with a shift from diversified, small farms, to larger, specialized operations with more livestock. Consequently, nutrients are cycled less within each farm, and more grains for livestock feed are imported from other areas, such as the Midwest. The livestock manure remains here, resulting in a **net increase in nutrients** in Pennsylvania, the root of many of our excess nutrient problems.

Conservation "Best Management Practices" (BMPs) provide significant benefits for maintaining nutrients on crop land, reducing soil erosion, and preventing pollution of waterways. Some examples include:

- **RIPARIAN BUFFERS**, especially forested buffers, along streambanks, help protect streams by absorbing nutrients and retaining soil, as well as providing shade that cools water temperatures. Stroud Water Research Center found that forested streams are far more efficient at removing key pollutants in the water than non-forested streams because they improve the physical, chemical, and biological conditions of a stream so that it can cleanse itself of many pollutants.
- **STREAM BANK FENCING** protects the buffer, and keeps livestock out of streams so they cannot erode the banks and excrete waste directly into the streams.
- **NO-TILL CROPPING** is a low-impact method of farming that retains the root systems of previously cultivated crops by inserting seeds into the ground without plowing. This allows the land to absorb more nutrients and retain soil in its place.

Agriculture's Progress in Meeting Chesapeake Bay Tributary Strategy Goals
(Chesapeake Bay Program Data)



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Reducing Nutrient Pollution Through Precision Feeding

Precision feeding reduces nitrogen and phosphorus in animal feed to the levels required to maintain healthy livestock, so that less is excreted in the manure. Getting the right balance of nutrients is a real challenge, and requires careful analysis of a farm's forage and feed supplies, along with herd health and production. Precision feeding can reduce manure nitrogen by 30–50 percent, and manure phosphorus by 40–60 percent. When herds are fed to meet health and milk-production requirements, they can utilize nutrients more efficiently, decrease excreted nutrients, and maintain or improve production.

Precision feeding can: reduce feed costs, increase milk production, improve herd health, reduce manure management costs, and reduce the amount of nitrogen and phosphorus pollution entering local streams and rivers.

- **COVER CROPS** are typically planted in the fall, and consume excess nutrients remaining in the field after harvest, and also prevent soil erosion.
- **NUTRIENT MANAGEMENT PLANS** help producers apply nutrients from manure and other sources at the proper time and rate that will be used by the crops to improve production, reduce nutrient runoff, and improve soil and water quality.

Estimating the implementation levels of agricultural Best Management Practices across Pennsylvania is challenging, because the only data is available on conservation efforts where an outside agency provides technical or financial support. This data excludes farmers' independent conservation efforts, so it is virtually impossible to estimate all that is being done. The Chesapeake Bay Program, in spite of these data shortfalls, shows that significant efforts have been made to reduce agricultural nutrient and sediment loads from farms.

Pennsylvania agriculture has cut annual loads of nitrogen by almost 18 million pounds, phosphorus by almost 350,000 pounds, and sediment by almost 150,000 tons. However, Pennsylvania must continue its commitment to work toward its requirements under the Chesapeake Bay Agreement to be in compliance with the federal Clean Water Act.

State & Federal Support

Agricultural producers are squeezed by steep increases in the cost of fuel, livestock feeds, real estate, and other operating costs. Farmers often find it very difficult to bear the costs of conservation efforts that are so important for water quality improvements, so additional funds are critical. The vast majority of state and federal programs providing assistance for conservation efforts require that the farmer provide a portion of the costs, so they leverage private investments in conservation.

Pennsylvania created the Resource Enhancement and Protection (REAP) Program in 2006 to allow farmers and businesses to earn tax credits in exchange for a portion of the costs of agricultural conservation practices that will enhance farm production and protect natural resources. REAP supports conservation plans, nutrient management plans, stream fencing, riparian buffers, barnyard improvements, manure storage, no-till equipment and grazing systems. In the first two years, the \$10 million cap was reached shortly after applications were accepted, demonstrating that farmers are committed to investing in water quality improvements. Additional funds are clearly necessary in order to meet the demand for more conservation.

In May, the U.S. Congress passed the **Food, Conservation, and Energy Act of 2008**, commonly known as the "Farm Bill," that provides an unprecedented **\$440 million** in additional conservation funding for practices that maintain soil and nutrients on the land, and protect rivers and streams. Farm Bill conservation programs are a critical tool in improving water quality and conserving soil. Moreover, the programs have been so popular with farmers that enrollment has far exceeded availability. Fortunately, the 2008 Farm Bill more than doubles the amount previously available for federal technical and financial assistance for conservation. The new Farm Bill increases national conservation program funding by \$7.9 billion. It also includes a new Chesapeake Bay Watershed Program, with \$188 million through 2012 to reduce sediment and nutrients entering ground and surface water on agricultural lands throughout the watershed, with special consideration for the Susquehanna River basin.

How You Can Get Involved

While it's important to be aware of the agricultural impacts on the environment, it's even better to get involved by volunteering with your local watershed group, Trout Unlimited chapter, Nature Conservancy or conservation district. The region's Conservation Districts' contact information:

CENTRE CONSERVATION DISTRICT

414 Holmes Avenue
Suite 4
Bellefonte, PA 16823
Phone: (814) 355-6817
resweitz@co.centre.pa.us

CLEARFIELD CONSERVATION DISTRICT

650 Leonard Street
Clearfield, PA 16830
Phone: (814) 765-2629
clfdccd@atlanticbbs.net

CLINTON CONSERVATION DISTRICT

45 Cooperation Lane
Mill Hall, PA 17751
Phone: (570) 726-3798
conserve@comcast.net

COLUMBIA CONSERVATION DISTRICT

702 Sawmill Road
Suite 204
Bloomsburg, PA 17815
Phone: (570) 784-1310
Maryruth.Wagner@pa.nacdnet.net

LUZERNE CONSERVATION DISTRICT

485 Smith Pond Road
Shavertown, PA 18708
Phone: (570) 674-7991
info@luzernecd.org

LYCOMING CONSERVATION DISTRICT

542 County Farm Road
Suite 202
Montoursville, PA 17754
Phone: (570) 433-3003
mark.davidson@pa.nacdnet.net

MONTOUR CONSERVATION DISTRICT

112 Woodbine Lane
Suite 2
Danville, PA 17821
Phone: (570) 271-1140
mcdklesh@fastgateways.com

NORTHUMBERLAND CONSERVATION DISTRICT

RR #3 Box 238-C
Sunbury, PA 17801
Phone: (570) 286-7114 ext. 4
Judy.Becker@pa.nacdnet.net

SNYDER CONSERVATION DISTRICT

403 West Market Street
Middleburg, PA 17842
Phone: (570) 837-0007 ext. 5
renee.swineford@pa.nacdnet.net

UNION CONSERVATION DISTRICT

155 North 15th Street
Lewisburg, PA 17837
Phone: (570) 524-3860
jerb@unionco.org

It's also important to be aware of legislation regarding environmental issues. For state and federal policies, as well as information about the relationship of your local streams, the Susquehanna River and the Chesapeake Bay, visit the Chesapeake Bay Foundation web site at www.cbf.org.

There are also many things you can do within your daily life to minimize the pollution to local rivers and streams, as well as the Bay. Here are just a few to get you started:

- **Conserve water.** Take shorter showers, do only full loads in the dishwasher and washing machine, garden with native plants that require less water than tropical ornamentals and use kitchen rinse water for watering plants.
- **Use phosphate-free products.** Check the label and purchase non-toxic products.
- **Don't use fertilizer** on your lawn unless it is necessary.
- **Cut grass higher** and let the clippings remain as natural fertilizer.
- **Properly maintain your septic tank by pumping every 3-5 years** so that human waste does not leach into groundwater.
- **Drain rain gutter downspouts into grassy areas** to increase absorption.
- **Buy local foods** that have not traveled as far to get to where you are.
- **Use unbleached paper products, such as coffee filters.** The bleaching creates dioxin, a pollutant that can travel into streams and rivers.
- **Turn down the heat.** Regulating the thermostat at 3° higher/lower in the appropriate season can prevent 1,000 pounds of emissions annually per household. Electricity and automobiles emissions initially cause air pollution, but that same pollution eventually settles on the ground where rain carries it to streams and rivers.
- **Use less electricity.** Use energy efficient light bulbs, and Energy Star rated appliances. Many forms of energy generation lead to air pollution, that also settles to the ground.
- **Drive less.** Walk more, carpool, ride your bike or take public transportation.
- **Keep the car tuned and tires properly inflated.** An efficient car reduces exhaust fumes.

Monitoring the Susquehanna

SRHCES conducts many studies on the ecology of the Susquehanna River and its surrounding environment. Currently, the group monitors water quality on at least 17 different sites along the Lower West Branch of the Susquehanna River in addition to projects at the PPL Montour Preserve, Shamokin Creek, Montandon Marsh and other locations. The coalition recently received approval from the Pennsylvania Department of Conservation and Natural Resources (DCNR) to construct an Environmental Center at the Shikellamy Marina – an asset for all of the universities as well as the community. In addition, the coalition is in the process of installing three monitoring stations at points along the Susquehanna River in Lewisburg, Northumberland and Danville, which will send real-time river data to a hub where researchers can use the information. The monitoring stations are a major step in the coalition's goal of conducting comprehensive water quality assessment on the Susquehanna River. 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.

Mohamed Khalequzzaman

*Associate Professor and
Department Chair of Geology & Physics,
Lock Haven University of Pennsylvania*

Professor Mohamed Khalequzzaman, or Dr. K for short, is currently expanding his research on the effects of agricultural practices on river systems. For seven years he has been collecting monthly samples from 10 sites along Big Fishing Creek in Clinton County. He has monitored various chemical parameters in the water including pH, dissolved oxygen, turbidity, phosphate and nitrate. Agricultural run-off can cause significant damage to a stream, potentially creating high levels of nitrates and phosphates that then cause excessive algae growth, which limits the amount of oxygen available to fish and other aquatic organisms. Increases in turbidity, or murkiness (turbidity measures the clarity of the water in relation to the total amount of suspended solids within it) can also cause fish and other aquatic organisms to suffocate, in addition to killing fish eggs. Dr. K is expanding the scope of his study to include Little Fishing Creek, Cedar Spring and Long





Dr. K's Student Intern John Woodward samples water from a discharge at the BAMR passive treatment facility in the Beech Creek Watershed.

Run, all tributaries to Big Fishing Creek. He will now have 17 sampling sites to visit once every month. He will also be looking at additional parameters, such as hardness, alkalinity and sediment, as well as the chemical parameters he has been monitoring. Dr. K works closely with the Sugar Valley Watershed Association and the Clinton County Conservation District, providing them with data on the agricultural impacts to the streams. They work together to encourage best management practices and remediation plans.

Dr. K also recently completed a two-year study funded by the Degenstein Foundation on the effectiveness of an abandoned mine drainage (AMD) passive treatment system installed by the Bureau of Abandoned Mine Reclamation (BAMR) in the Beech Creek Watershed, along Big Run. Working with Dr. John Way, Emeritus Professor of Geology at Lock Haven University, and John Woodward, a student intern, Dr. K has determined that the effectiveness of the treatment facility is declining. This means that the facility is failing to remove harmful metals from the water and failing to create a strong alkaline buffer. The limestone in the treatment ponds responsible for boosting alkalinity has become coated with iron hydroxide, an orange-yellow coating known as "yellow boy," which weakens the influence of the limestone. The "yellow boy" coating can potentially be washed from the limestone and buried in a landfill or sold to eco-friendly companies who use it as a pigment; however, this process is often complex and expensive. Dr. K is recommending to the Beech Creek Watershed Association that they add limestone sand to Wolf Run, a tributary to Beech Creek, as a means of boosting the alkalinity. With another grant from the Community Foundation for the Alleghenise, Dr.

K will continue his monitoring of the BAMR passive treatment facility for a third year, focusing on AMD-impacted areas that are bypassing the treatment facility and flowing into the Middle Branch of Big Run at other locations.

Carlos Iudica

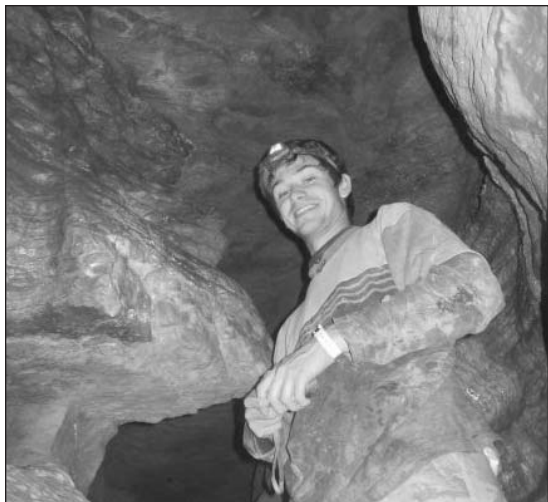
*Assistant Professor of Biology,
Susquehanna University*



This summer Professor Iudica is travelling with his student intern to South Dakota to learn caving techniques, which he will use to explore local pitfalls in central Pennsylvania. He hopes to find old animal remains that will be able to tell him what animals existed at given times in history (i.e. do the same animals exist today that existed 100,000 or even one million years ago). In this way, he can observe the historical affects of climate change on animals and compare the data with his current studies at the PPL Montour Preserve and Shikellamy State Park, where he is in the middle of a ten-year project that seeks to gain a perspective on how terrestrial vertebrate (including amphibians, reptiles and mammals) populations change through seasons and over time. He will combine his current data with data he collects from the local caves in order to create a trajectory of which animals existed in the past and which animals exist now. He will spend the summer learning caving techniques in addition to learning basic paleontology, such as identifying and dating bones. Professor Iudica has been monitoring animals for the past four years at the PPL Montour preserve and Shikellamy State Park. He monitors animals such as bats, mice, owls or foxes for any number of qualities including location, growth rate, food consumption and life span. He also looks at the impact of the river on these different vertebrates. He plans to have a student intern working with PPL to create an interactive website that will display and



Professor Iudica and his student intern get ready to go caving.



Professor Ludica's student intern caving this summer.

document the animals that are being preserved in the area. He also has an intern working with SRHCES colleague Dr. Peter Petokas on ecological aspects of Hellbenders in Loyalsock Creek, an intern monitoring a maternity colony on the Isle of Que and two other interns studying carnivore diets and owl ecology.

Matthew McTammany
*Assistant Professor of
 Biology & Environmental Studies
 Bucknell University*



Professor Matthew McTammany has been instrumental in working with the Environmental Center at Bucknell University and SRHCES, moving both groups forward in water quality assessment by obtaining a federal earmark that will allow for the purchase of two monitoring stations – one to be placed along the river in Lewisburg and one at the confluence in Northumberland – which will measure parameters such as pH, temperature, dissolved oxygen, turbidity and chlorophyll concentration, and send the data to a hub where it can be easily collected. One more station will be obtained by Geisinger with funding from the Cora Brooks Foundation, and will be placed in Danville. Professor McTammany is applying for the funding to purchase one more roving monitoring station that can move along different tributaries of the Susquehanna River. Obtaining these monitoring stations is the first step in developing real time measurements that will culminate in a “state of the river” report card assessment – an asset necessary to determining water quality improvement. In addition to Professor McTammany’s development work, this summer he is studying the process of eutrophication within the Susquehanna River. Eutrophication occurs when the amount of nutrients, such as nitrogen and phosphorus, rapidly increase causing excessive plant

growth, like algae blooms, which blocks the sunlight from fish and other aquatic species, in addition to usurping available oxygen. Eutrophication significantly impacts the Chesapeake Bay, the consequence of excessive nutrient loads channeling to the bay from various sources. Professor McTammany is monitoring the eutrophication process in shallow, slow-moving parts of the Susquehanna River, where he can observe fluctuations in dissolved oxygen levels between night and day. Low dissolved oxygen concentrations will not immediately harm fish but, long periods of low oxygen concentrations can result in massive fish kills.

Professor McTammany’s interest in eutrophication represents part of his overall interest in the ways that the Susquehanna River is impacting the Chesapeake Bay. In another study with SRHCES colleague, Dr. Steven Rier of Bloomsburg University, Professor McTammany is analyzing how abandoned mine drainage (AMD)-impacted streams retain nutrients. This is important because a stream’s ability to retain nutrients can prevent the eutrophication process (i.e. prevent too many nutrients from accumulating in one area and creating the massive algae blooms we see in the Chesapeake Bay). AMD-impacted streams are not often able to retain many nutrients, and thus they contribute to excessive nutrient loading to the bay. Last year Professor McTammany and Professor Rier studied streams in Tioga County, which is a bituminous coal region. They have received funding to expand their study to include streams in Schuylkill County, which is an anthracite coal region and thus produces a different type of



Professor McTammany's intern, Leo Zacks, samples the headwaters of Buffalo Creek in Bald Eagle State Forest.

drainage impact on the water. Just as before, they will study a healthy stream, an AMD-impacted stream and a restored stream, in order to analyze the different ways in which the streams process nutrients.

Professor McTammany is also studying acid rain on Buffalo Creek with a student intern. McTammany has a working relationship with the Buffalo Creek Watershed, for whom the student is collecting data. The headwaters of Buffalo Creek are chronically acidified, meaning they consistently have a pH of 4.5 or less. The watershed is bidding for an alkalinity-producing wetland to be built in August or September that would improve between seven and eight miles of water downstream. The intern is collecting pre-wetland construction data at the headwaters in order to determine if the downstream reaches of Buffalo Creek are episodically acidified during precipitation.

Steven Rier

*Assistant Professor of Biology
& Ecology, Bloomsburg
University of Pennsylvania*



This summer Professor Steven Rier is sharing an intern with his colleague Professor Clay Corbin, who is studying the way abandoned mine drainage (AMD)-impacted streams affect the bird community. Streams are a source of food for birds since they eat the insects that live along the stream. However, if the insect community has declined due to AMD, the bird community could also potentially decline. For the first part of this summer Professor Corbin and his intern will be documenting things like the number of bird nests along the river and whether or not the birds are reproducing. In July, the intern will move to work with Professor Rier and his SRHCES colleague Professor Matthew McTammany to



Emily Barkanic, a student intern working with Professor Rier, takes a water sample during an AMD study.

study nutrient retention in AMD-impacted streams in the anthracite coal region.

Professor Rier is also working with a graduate student on the impacts of AMD on stream ecosystem function in the Wilkes Barre area. They are measuring the effects of seepage from a coal refuse pile on Gardner Creek. Professor Rier and his student are measuring the impacts of this seepage on the microbial and invertebrate communities currently living in the water.

Finally, Professor Rier is studying acid deposition with another graduate student at the Fishing Creek headwaters. Similar to his AMD research with Professor McTammany, Professor Rier is looking at the ways in which acid deposition (which contributes nitrogen to the stream) affects nutrient processing within streams.

Mel Zimmerman

*Professor of Biology and
Director of the Clean Water Institute,
Lycoming College*



This summer Professor Mel Zimmerman is managing six interns in various river monitoring and stream restoration assessment projects. Some of these projects include guiding his interns through post-monitoring on Roaring Branch Creek, where recently the US Fish and Wildlife Service completed a 2,500-foot fish habitat improvement project. Similarly, at Muncy Creek, Professor Zimmerman and his interns are following up on a restoration project that included natural stream channel design and habitat improvement. The restoration project was started five years ago and Professor Zimmerman will be studying its continued effectiveness. These projects represent the sort of community outreach Professor Zimmerman organizes through the Clean Water Institute, an organization that provides internships for students who then perform research for local watershed groups. The Institute provides data for communities in addition to offering training programs and seminars on such environmental issues as stream restoration, habitat improvement and water quality. The institute maintains an on-going relationship with the Rose Valley/Mill Creek Watershed Association where Professor Zimmerman and others are currently working with the PA Fish and Boat Commission on a fish habitat restoration project.

In addition to his interest in stream restoration, Professor Zimmerman also monitors sewage treatment plant effluents and the effects of Combined Sewer Overflow (CSO) on water quality. CSOs typically occur after heavy rain, which overburdens sewage treatment

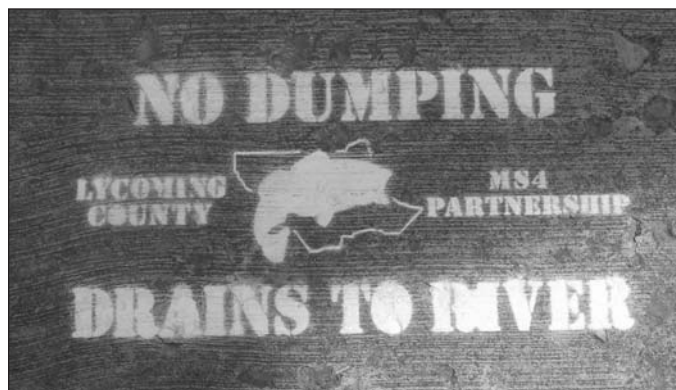


Tracie Curtis and Max Olsen, interns with the Clean Water Institute, hold a 19-inch Brook Trout discovered during field work.

plants. As a result, the storm water bypasses the plant and carries raw sewage into the river. He currently has 12 sites on the Lower West Branch, above and below sewage plants, that he samples monthly to track changes in water chemistry, coliform bacteria counts and macro invertebrate diversity.

He is also currently conducting research for Cromaglass, Inc., a wastewater treatment company that is developing a new biofilter that would reduce the amount of nitrogen released into the water from sewage treatment plants. Professor Zimmerman is conducting water quality tests to help the company gauge the effectiveness of its potential product.

Finally, in an effort to raise awareness about the inappropriate disposal of pollutants in storm drains, this summer Professor Zimmerman and his interns will start to paint 13,000 storm water drains with "No Dumping" labels. This multi-year effort is part of the Municipal Separate Storm Sewer System (MS4) program, a by-product of the Greater Williamsport Alliance, a



Professor Zimmerman and his students began painting this seal on drains throughout the Williamsport area this summer. Eventually, 13,000 drains will be painted as part of the MS4 program.

group which aims to protect water resources from polluted storm water runoff. When pollutants such as motor oil or hazardous household materials are dumped directly into storm drains, they travel straight to the river and damage water resources.

Brian Mangan

Professor and Director of King's College Environmental Program and The Susquehanna River Institute



Professor Brian Mangan is a river ecologist who studies the many interactions that occur between organisms and the river (including humans). Much of Professor Mangan's research involves monitoring the Susquehanna River for signs of change caused by pollutants and invasive organisms.

During the summer of 2008, with a grant obtained by SRHCES, Professor Mangan, two undergraduate students and a teacher from Hazleton funded by a Penn State Sea Grant have been collecting data on the diversity and relative abundance of crayfish in the Susquehanna River. This study was initiated because of observations Professor Mangan made two years ago of large numbers of crayfish in the Halifax area (about 20 miles north of Harrisburg). At that time he had been comparing the density of Asian clams in the main stem of the river to the North Branch. Based upon those observations, he is now searching for a possible connection between Asian clams and crayfish abundance.

Crayfish were collected in traps designed and built by Professor Mangan and his students. At each sample location, 100 traps were baited with cat food and placed in the river. Water depth, velocity and substrate-size measurements were taken near each of the traps in hopes of discerning crayfish habitat preferences. These results will be analyzed in the fall.

Unfortunately, the only species of crayfish Professor Mangan collected from more than 10 sampling locations along a reach of over 100 river miles has been the invasive, rusty crayfish. However, since crayfish are the "keystone species" in aquatic ecosystems it is essential that a baseline of relative abundance be established for even this exotic species.

Professor Mangan, in conjunction with SRHCES, is also preparing to begin monitoring and researching mercury levels in fish and other species in northcentral and northeastern Pennsylvania. Besides gaining a better understanding of how mercury bioaccumulates and biomagnifies in living organisms in the Susquehanna

Watershed, including humans, Professor Mangan hopes that the data collected can be used by agencies such as the Pennsylvania Department of Environmental Protection (DEP) and the PA Fish and Boat Commission (PFBC) in establishing fish consumption advisories in the area.



One of the many crayfish collected by Professor Mangan this summer.

Jack Holt

*Professor of Biology,
Susquehanna University*



Professor Jack Holt is an Aquatic Ecologist who studies attached diatoms (or algae attached to rocks, wood, etc. within streams) as a way of gauging water quality in Lower Penn's Creek, Shamokin Creek and Middle Creek. Since the diatoms are attached, they represent something fixed within a fluctuating river system and thus operate as recording devices for changes in water quality. Benthic invertebrates are another type of species often studied to gauge water quality, but they are not dramatically impacted by events such as rain. Diatoms, on the other hand, are very sensitive to the effects of rain, making them useful to study. Professor Holt captures diatoms with a diatometer – a box that holds slides which attract diatoms and holds them in place. After about 3 weeks, he collects the samples and analyzes them to see which types of diatoms are present (for example, in Lower Penn's Creek there are between 50 and 60 diatoms, according to his research). Certain combinations of diatoms in a given stream (this varies from stream to stream) indicate a level of water quality.

Professor Holt's goal in studying the three streams – Lower Penn's Creek, Shamokin Creek and Middle Creek – is to establish a diatom baseline for each stream. In other words, he needs to figure out what combination of diatoms indicates good water quality in each stream. He has just

completed his baseline study of Lower Penn's Creek, where he had 12 different sample sites for the last two years. He will soon begin applying the same methodology on Middle Creek, an agriculturally-impacted stream with two reservoirs forming its tributaries and aiding in sediment loads. He currently has five sampling sites on Shamokin Creek, where he is working with colleague Ahmed Lachhab to alleviate the smell coming from the abandoned mine drainage (AMD) treatment facility currently causing an abundance of local complaints. Professor Holt's water quality tests, however, indicate that the facility is successfully treating AMD and improving water quality in the area.

In addition to his scientific research, every summer Professor Holt travels with two students to Yaroslavl, Russia, where they study the water quality of glacial lakes in the region. The students gain immersion experience while learning about the environment through a cultural and scientific lens. They stay in Yaroslavl for 4-5 weeks, earning two credits, keeping daily journals and completing research.

Peter Petokas

*Research Associate with the Clean
Water Institute at Lycoming College*



For the last two years Dr. Peter Petokas has been documenting Eastern Hellbender populations in various tributaries of the Susquehanna River. Working under a contract with the Pennsylvania Fish and Boat Commission (PFBC), he has been recording where they live, the conditions in which they live, whether or not they are reproducing, how old they are, how big they are and how many there are. Now, however, with his work for the PFBC complete, Dr. Petokas is working to document the microhabitat characteristics of the Hellbender. This means he is looking at the physical, biological and chemical characteristics of the stream where a given Hellbender population is living. He will look at things like light intensity, dissolved oxygen, water velocity and the amount of space available to Hellbenders underneath the rocks where they live. He will also be looking at things like food availability, which, for Hellbenders, includes mostly crayfish.

The Eastern Hellbender is one of the largest salamanders in North America, growing up to 29 inches in length. Olive in color, Hellbenders are found throughout the eastern United States in shallow, fast-flowing streams with plenty of large rocks to live under. Their population has declined in some areas for various reasons. Both the



The Hellbender can grow up to 29 inches in length.

logging and agriculture industries negatively affected Hellbender habitat by causing sediment to fill in the areas under the rocks where they live. In the 1930s, Hellbenders were hunted because it was believed that they ate trout and trout eggs, a misconception that damaged the population. Additionally, abandoned mine drainage (AMD) impacted streams that don't sustain aquatic life such as fish, crayfish and insects, can't sustain Hellbender populations. Dam development can also limit Hellbender dispersal, forcing Hellbender populations to be even further isolated.

Recently, Dr. Petokas documented Chytrid Fungus in Hellbenders, a disease that is linked to the global decline in amphibian populations. The fungus penetrates the keratin-rich skin cells of amphibians, but it is yet unknown how it actually causes mortality. Dr. Petokas is seeking grant money to further investigate the development of the disease in Hellbender populations.



Professor Lachhab at the passive treatment facility at Shamokin Creek.

The Hellbender is a protected species, so if you happen to find one, you should return it to its habitat. The Hellbender is not poisonous, nor does it bite, so don't be fearful of handling it in order to return it to the stream. Dr. Petokas is dedicated to doing whatever he can to help the Hellbender population grow to its former abundance. His public activism includes over 30 presentations to various watershed groups, schools and sportsmen's groups. If you have information about Hellbenders, or are interested in learning about them, don't hesitate to contact Dr. Petokas.

Ahmed Lachhab

*Assistant Professor of Earth
and Environmental Sciences,
Susquehanna University*



Professor Lachhab is a groundwater pollution specialist who is currently working with Susquehanna University and SRHCES colleague Jack Holt and two student interns at the abandoned mine drainage (AMD) passive treatment facility at Shamokin Creek (Site 15) and Middle Creek. While the monitoring of the Middle Creek project is still at an early stage, the work at Site 15 is maintained by observing discharge and metal concentrations. The treatment facility has been very successful at treating the drainage, both reducing the amount of metal in the water, while simultaneously increasing the pH and boosting alkalinity. However, one by-product of the treatment system is hydrogen sulfide which, in high amounts, creates the intense odor that has instigated significant complaints from the community. Professor Lachhab and his interns are sampling the water all around Site 15 to get a sense of how much total sulfite is in the water, which allows them to quantify the amount of sulfide (H₂S, the source of the

smell) in the air. Depending on the wind speed and direction, a model will be proposed to calculate the dispersion of the H₂S plume compared to the distance.

In order to become more informed about the way passive treatment systems work, Professor Lachhab also wants to use a column experiment that mimics the system, including the layers of mushroom compost and limestone, in a more controlled laboratory setting. This would allow him to see the finite chemical detail of passive treatment systems, helping him to understand them more thoroughly, and ultimately showing him ways of improvement.

**Bucknell University
Environmental Center**

*Craig Kochel, Co-Director and
Professor of Geology;*

*Peter Wilshusen, Co-Director and Assistant Professor of
Environmental Studies; Benjamin Hayes, Program
Director and Susquehanna River Initiative Coordinator*



This summer the Environmental Center at Bucknell University is keeping many interns busy with local restoration projects at Montandon Marsh and the Sunbury Wetlands, as well as stream restoration assessment and nature trail designing. The projects represent outreach and research requirements included in the Susquehanna River Initiative – a proposal approved by the Henry Luce Foundation Public Policy and the Environment program in the form of a grant worth \$450,000.

Interns working at the Montandon Marsh are joining with members of the Linn Conservancy and the neighboring gravel company, Central Builders Supply Company, to create a natural wetland. The Montandon Marsh is the largest palustrine wetland in the state and together these groups are working to reclaim it. Interns are taking inventory of existing plants in the wetland, and working from there to design and develop a thriving nursery.

Since 1991 Central Builders has been working with Bucknell to minimize the impacts of mining on the marsh. The company has allowed Bucknell students to use the marsh as a lab, an excellent example of the ways in which universities and businesses can work together.

The success at Montandon Marsh is operating as a model for restoration work at the Sunbury wetlands, a 1-acre palustrine wetland degraded from urban neglect. Major clean-up efforts have already removed three dumpster loads of waste from the

area, which, despite its poor condition, serves as an important refuge for birds, amphibians and wetland plants.

Additionally, one student intern is working on an assessment of stream restoration by looking at streams in Northcentral Pennsylvania. His goal is to show that stream restoration needs to be developed on a stream-by-stream basis, rather than through any general scheme. The individuality of a stream demands specificity, rather than uniformity, a major conflict currently within the field of stream restoration.

Finally, interns are also designing a nature trail at Turtle Creek, a nature park that was recently bought by the Degenstein Foundation and offered to the Environmental Center for research opportunities.

The Luce Grant will last for three more years and will touch well over 100 students in various fields from the natural sciences to the humanities. In the upcoming academic year, two interdisciplinary courses will be offered through the Susquehanna River Initiative, one in the fall on Watershed Systems Science, and one in the spring on Stream Restoration. Both of these courses will involve out-of-the-classroom learning opportunities with various local partners.

The Environmental Center is also partnering with groups like SRHCES to establish a field station at the Shikellamy Marina, in addition to developing a "State of the River" report card that would assess water quality in the Heartland Region.



*Students interning with
the Bucknell University
Environmental Center are
working to reclaim
Montandon Marsh.*

Community Development... (SEDA-Council of Governments)

SEDA-Council of Governments (SEDA-COG), one of the members of SRHCES, was a key partner in planning the Susquehanna Greenway and in forming the Susquehanna Greenway Partnership (SGP). SGP is a private non-profit organization that advocates tying various communities along the 500-mile corridor of the Susquehanna River together through the celebration of the river. The group seeks to bring economic development, community revitalization, enhanced recreation and healthy living opportunities to the many communities established within the corridor. As a means of generating smart community growth the group considers environmental planning, community atmosphere, health concerns and economic development. Ultimately, by tying all of the towns together with a common focus on the river, the group seeks to create a regional identity for the residents of the river community.

SEDA-COG has been contributing to the partnership by meeting with local communities to establish plans of action. Community planners and landscape architects provide technical assistance to communities to try to learn what the community would like to see happen, discuss what is feasible and generate plans for development. The following are examples of projects that are developing in the region.

Revitalizing River Towns

SEDA-COG is currently working with towns in the Heartland Region – including Berwick, Bloomsburg, Catawissa, Danville, Watontown, Milton, Lewisburg, Northumberland, Sunbury and Selinsgrove – to develop experiential narratives and themes that emphasize each town's unique identity within the river region. The towns are assessed for place-based assets, such as historic districts, downtown centers, river connections and recreational sites like parks, greenways and natural areas like waterways and wetlands. These assets will be drawn out in order to

understand the character and sense of place within each town, and how the collection of river towns contributes to the overall identity of the region. The ultimate goal is to identify projects and strategies that will celebrate each town's authenticity by recognizing the land, the history, the culture, the appearance and the economics of the area. The development of river town character assessment and experience maps is currently in progress and is expected to finish in October. SEDA-COG anticipates that a strategic action plan for implementing the town and regional themes will be fully developed by December.



The view overlooking the river at Northumberland.

Middle Susquehanna Heritage Area

The Pennsylvania Heritage Areas Program (PHAP) is sponsored by the state and administered through the Department of Conservation and Natural Resources (DCNR). The program encourages multi-county regions to apply for heritage area status, a designation that ultimately funds regional heritage projects such as museums and parks. The goal of the program is to celebrate Pennsylvania's rich history while simultaneously promoting economic development. Furthermore, the program seeks to preserve, enhance, interpret, and promote regional heritage through greenways and other projects in addition to generating private and public community partnerships.

Through the celebration of regional identity, established by the dispersal of a common theme, communities can be brought together and cultural heritage can be conserved. There are currently twelve regions designated as state heritage areas and within the next few years, the Middle Susquehanna Region might be added to the list.

Working with interns and faculty advisors from Bucknell, Bloomsburg and Susquehanna Universities, along with an extensive task force of regional stakeholders, SEDA-COG has been conducting a feasibility study, which will build a case for establishing this region as a state heritage area. They are looking at the eligibility of a five-county area, including Union, Snyder, Columbia, Montour and Northumberland counties. The feasibility study must define a common theme (deriving from industrial heritage) that has significantly shaped and created the region that we know today. Research to date suggests a transportation theme, including canals, the river, railroads, trails, roads and trolleys. The feasibility study is expected to be complete by December, at which point it will be submitted to DCNR for approval. If the study is approved, the next step will be to create a long-term, 10-year regional development and management plan.

Susquehanna River Sports Park

Plans are developing for the construction of a boathouse and community park along the Susquehanna River in the Heartland region. SEDA-COG is currently investigating five different locations suitable for building a boathouse, which would provide facilities for public use as well as contain both Bucknell and Susquehanna University rowing equipment, and equipment belonging to the Central Pennsylvania Rowing Association. The Susquehanna has been recognized as a high-quality river for rowing, and

SEDA-COG hopes that the construction of a boathouse and community park will encourage the development of a rowing community, including high school students who could take advantage of the abundance of Title IX scholarships available in rowing. Furthermore, SEDA-COG hopes that the park could eventually host rowing competitions and regattas, providing the region with an economic boost. After SEDA-COG has chosen a site and developed the final plans for the building and park, they will submit a proposal for funding to DCNR, with other funding sources available from Bucknell, Susquehanna and the Central Pennsylvania Rowing Association.



A view of the river from the town park in Bloomsburg

Danville Riverfront Project

The Danville Riverfront Project will include a levee-top walking trail, with information that would increase awareness about levees and flooding. The trail would create a walking route along the entire riverfront, including a path to the soccer stadium as well as riverfront parks.

North Branch Canal Trail

The Feasibility Study of the North Branch Canal Trail will be submitted to DCNR for approval in December. The North Branch Canal Trail will travel along the historic North Branch Pennsylvania Canal and will connect Catawissa, Danville and Bloomsburg. The trail will maintain the natural character of the canal corridor and celebrate the history of the canal system, not to mention tie together the communities along the river. The trail is meant to encourage healthy recreation for local residents of all ages. Since the trail will extend across county lines, SEDA-COG is hoping to create a regional trail organization that will run and maintain the trail for the public.

Please visit www.seda-cog.org for further information.

Susquehanna River Heartland Humanities Council

The Susquehanna River Heartland Humanities Council is the humanities department of SRHCES. Devoted to river research as it applies to the history and culture of the region, the Humanities Council began late in 2005 and has inspired a number of ongoing projects. Its long-term goals include developing curricular and bibliographic material about the Susquehanna Valley for local teachers and compiling a Works Progress Administration (WPA)-style guide to the Susquehanna Valley. Below you will read about the many projects that the group has been working on.

Cultures at the Confluence

The Humanities Council recently received a \$16,000 seed grant from the Ben Snow Trust, which will be instrumental in planning the Cultures at the Confluence project. The project will be a multi-year research and design endeavor, meant to expose the links between cultural and environmental history through online mapping and research material. The site will be a resource for local teachers to use as a means of increasing awareness about local history and the environment in the region. The project also seeks to propagate narratives about the region, promoting the investigation of historical narratives and the creation of new ones through creative non-fiction writing workshops.

Significant research has already been conducted on the multi-faceted history of the region, including the work of Bucknell University's German and Comparative Humanities Professor Katie Faull, who is currently translating the Moravian Diaries (also known singularly as the Shamokin Diary), which describe peaceful relations with the Native Americans around Sunbury. Written by at least ten different people in both Germanic script and English, and without standardized spelling and grammar, the project is no simple task. In addition to the diary entries, the collection includes about 50 pages of letters, documents, messages and addresses, all providing significant insight into the historic culture.

Research of this nature will be included in the Cultures at the Confluence series forthcoming from the APERCUS collection via the Bucknell University Press.

Captain John Smith Trail: Mid-Susquehanna Guide

Titled, "An Interpretative Guide to Native American Settlements and Culture along the Susquehanna," this guide will provide information about the settlements and culture of 17th century Native Americans along the Susquehanna River Water Trail. The Susquehanna River Water Trail is developing in conjunction with the Captain John Smith Chesapeake National Historic Trail run by the National Park Service. When completed (anticipated April 2009) the guide will include a map with references to the written material, which will also be available online.

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.



On a recent field trip members of the Humanities Council as well as students with the Bucknell University Environmental Center learned about the cultural and geological history of Antes Creek (shown at its headwaters in Nippenose Spring).

Educational Outreach Programs

Teaching communities about the river is an essential part of environmental restoration. Without education, it is difficult for a community to understand what is happening in the river and how they can help. The following summarizes some local educational initiatives that support environmental and ecological outreach.

The Susquehanna River Institute

Directed by Professor Brian Mangan, the Susquehanna River Institute is a partnership organization that seeks to direct public attention to the resources of the Susquehanna River by promoting educational initiatives and scholarly research. Currently, through King's College the institute offers a graduate course for science teachers. The course, generally titled "The Susquehanna River," is a five-day intensive workshop that includes traveling to various sites along the Susquehanna River. The teachers visit AMD-impacted streams, tour treatment facilities, learn about riparian areas and appropriate land management strategies, meet with watershed supervisors and learn about many other factors involved in river ecology. The course is usually offered twice. The first session, focusing on the North Branch, is taught by Professor Mangan. The second, focusing on the West Branch, is taught by Dr. Mel Zimmerman from the Clean Water Institute at Lycoming College, one of the institute's partners.

For more info about the courses please visit the Susquehanna River Institute website at www.susquehannariverinstitute.org or visit the Clean Water Institute at <http://www.lycoming.edu/biologydept/cwi>

The Susquehanna River Field School

The Susquehanna River Field School is coordinating what will eventually become a summer fellowship program opportunity for regional students. The Field School is currently in the first year of its pilot phase; students were hand-selected as Field School interns funded by their respective universities. Eventually the Field School itself will provide the funding, as well as work with each of the universities to provide fellows with course credit. The fellows would participate in a 10-week paid internship relating in some way to community enhancement. The fellows would also be required to participate in a weekly seminar, and at the conclusion of the internship, they are expected to present their research findings (this year they will be presenting at the Susquehanna River Symposium at Bucknell University). Students involved in this year's pilot phase are working on a variety of projects including the

development of a nursery at the Montandon Marsh, water quality analysis at Shamokin Creek and assessment of the sustainability and/or growth of the Bloomsburg Fair.

WVIA

WVIA, Northeastern Pennsylvania's Public Broadcasting Stations, has documentaries about the Susquehanna River available for use in the classroom as a way of educating students about the history and environmental issues surrounding the river.

Please visit www.wvia.org for further information, or email kathryndavies@wvia.org to order copies of the following DVDs.

"Looking to the River" explores the historical culture and development of the natural environment on the Susquehanna River. The DVD is available with a complimentary guide to classroom activities and teaching strategies. Please find more information about using this DVD in the classroom at:

<http://www.wvia.org/education/curricula/LookingtotheRiver.doc>.

"Expedition Susquehanna" follows eleven high school students who travel the whole length of the Susquehanna River in 30 days. Organized by the Chesapeake Bay Foundation, the program guides students through the various environmental concerns regarding the Susquehanna River. The students begin their trip in Cooperstown at the headwaters of the Susquehanna and travel south, making many stops along the way.

"Hope for Polluted Waters" was released last fall and is a one-hour production about abandoned mine drainage (AMD) and its impact on the river and river communities. The film follows the work of volunteer and environmental groups in their endeavors to transform many miles of waterways.

"Hearth and Harvest" is a forthcoming documentary about agriculture in Pennsylvania. The film follows eight Pennsylvania farming families for one year while discussing the ever-changing agricultural industry in Pennsylvania. The documentary will be available on DVD by fall 2009.

Trout Unlimited

Trout Unlimited has developed a program called “Trout in the Classroom,” where students have the opportunity to raise trout from eggs to fingerlings inside the classroom. Students are responsible for sustaining an aquatic habitat and are expected to closely monitor the environment. Local Trout Unlimited representatives have been promoting initiatives to get this program up and running in local schools. Lesson plans and web resources are available for this program at www.troutintheclassroom.org.

WKOK

News radio 1070 WKOK has been an active partner with SRHCES and has been diligent in covering issues pertaining to the environment and conservation. The station has shown tremendous support by organizing and broadcasting weekly roundtable discussions and implementing its “*Boroughs to the Bay and Beyond*” series. The series provides ongoing coverage regarding critical local environmental issues as well as discussion about the connections between the Susquehanna River and the Chesapeake Bay. Boroughs to the Bay and Beyond has shifted to emphasize agriculture this year, with the Pennsylvania Farm Bureau, Pennsylvania Agriculture Secretary and local agriculture leaders on the **Leaders &**



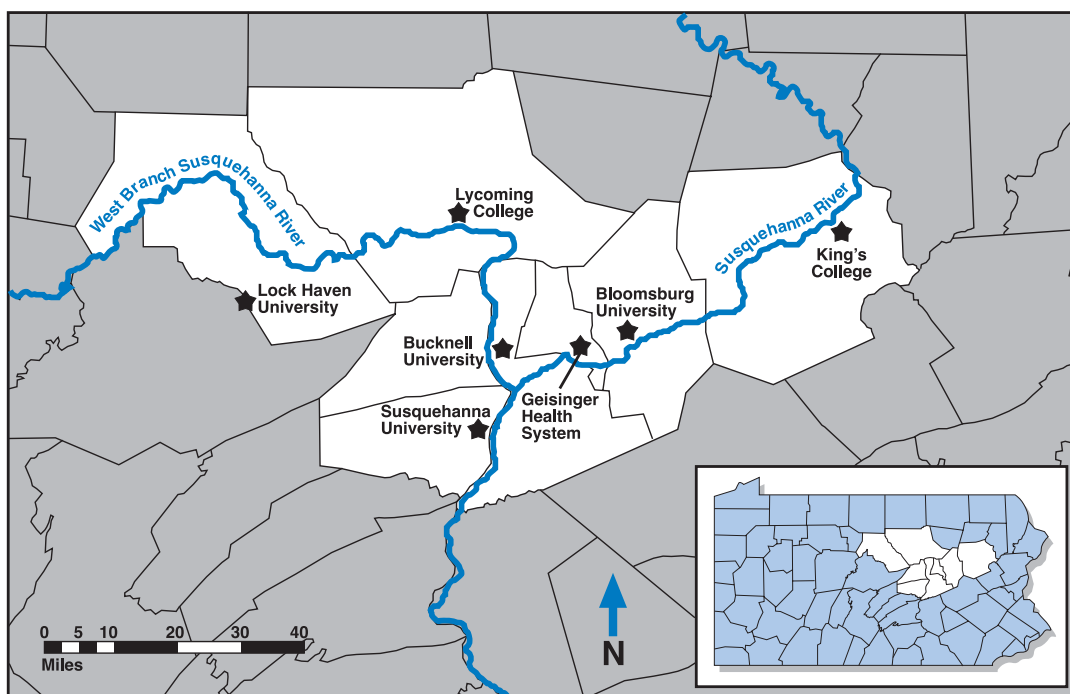
The Boroughs to the Bay and Beyond team recently received the AP's Joe Snyder Award for Outstanding News Service for its continued coverage on issues pertaining to the environment.

Lawmakers interview and **Roundtable** programs. WKOK strives to be an ‘open mic’ for groups, organizations and individuals who are working to achieve solutions in these critical watersheds. Recordings of these segments are currently used in classrooms, libraries and in other educational settings. The Boroughs to the Bay and Beyond series recently earned a first-place award from the Associated Press (AP) for its continued environmental focus.



**Susquehanna
River
Heartland
Coalition for
Environmental
Studies**

www.SRHCES.org



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

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