2016 Technical Meeting

The Pennsylvania Chapter of the American Fisheries Society

February 11th & 12th, 2016

Hosted by Susquehanna University

Degenstein Campus Center

Selinsgrove, Pennsylvania

SCHEDULE

Thursday, February 11	
11:00 AM -12:30 PM	Registration
12:30 PM - 12:45 PM	Opening Remarks **Doug Fischer**, Chapter President
12:45 PM – 1:30 PM	Plenary Speaker **Andrew Dehoff**, Executive Director of the Susquehanna River Basin Commission
1:30 PM - 2:00 PM	Break
2:00 PM – 2:20 PM	*Causal Analysis of the Smallmouth Bass Decline in the Susquehanna and Juniata Rivers* **Dustin Shull,** Pennsylvania Department of Environmental Protection
2:20 PM - 2:40 PM	*Comparing Drivers of Smallmouth Bass Reproduction and Recruitment in the Susquehanna River and Other Large Pennsylvania Rivers* **Geoffrey Smith**, Pennsylvania Fish and Boat Commission
2:40 PM - 3:00 PM	*Investigation of Smallmouth Bass Population Genetic Structure in the Susquehanna River Basin* **Megan Kepler-Schall**, Pennsylvania State University
3:00 PM - 3:20 PM	*Migratory Fish Restoration in the Susquehanna River* **Sheila Eyler**, United States Fish & Wildlife Service
3:20 PM - 3:40 PM	*Re-introduction Efforts and Current Status of American Eel in the Susquehanna River Basin* **Aaron Henning**, Susquehanna River Basin Commission
3:40 PM - 4:00 PM	*Evaluation of Macroinvertebrate Communities in Exceptional Value and High Quality Streams within the Marcellus Shale Region of the Susquehanna River Basin* **Luanne Steffy**, Susquehanna River Basin Commission
4:00 PM - 4:20 PM	*Use of In-situ Mussel Cages to Assess the Effects of Water Quality on Native Mussel Populations* **Kathleen Patnode**, United States Fish and Wildlife Service
4:20 PM - 5:00 PM	Chapter Business Meeting
5:00 PM - 6:00 PM	Hotel Check-in/Explore the Freshwater Research Laboratory @ Susquehanna University
6:00 PM - 9:00 PM	Poster Session / Social **(*food and beverages provided*)**

Friday, February 12	
8:00 AM - 8:20 AM	*Evaluation of Channel Catfish Spawning Success Using Pennsylvania Channel Catfish Spawning Boxes* **Ben Page**, Pennsylvania Fish and Boat Commission
8:20 AM - 8: 40 AM	*Examination Of A Single-Unit Multiple Pass Electrofishing Protocol To Reliably Estimate Fish Assemblage Composition In Wadeable Streams Of The Mid-Atlantic, USA* **Matthew Shank**, Susquehanna River Basin Commission
8:40 AM - 9:00 AM	*The Propagation and Management of Brown Trout (Salmo trutta) In the Pennsylvania Waters of Lake Erie* **Allen Keim**, Pennsylvania Fish and Boat Commission
9:00 AM - 9:20 AM	*The Hunters Station Bridge Replacement Project: Quality Assurance/ Quality Control of Salvage operations for Threatened and Endangered Freshwater Mussel species in the Allegheny River* **Eric Chapman**, Western Pennsylvania Conservancy
9:20 AM – 9:40 AM	*Updating the AFS Policy Statements for Conserving Rare, Threatened and Endangered Aquatic Species* **Patrick Shirey**, American Fisheries Society
9:40 AM - 10:00 AM	*Small Investment AMD Treatment Projects for Large Scale Brook Trout Restoration* **Tom Clark**, Susquehanna River Basin Commission
10:00 AM - 10:20 AM	**Break**
10:20 AM - 10:40 AM	*Spatial and Predicted Outcomes of Watershed Restoration in an AMD-Impacted Watershed.* **George Merovich**, Juniata College
10:40AM - 11:00 AM	*Aquatic Conservation Activities at the United States Fish & Wildlife Service's Northeast Fishery Center* **Mike Millard**, United States Fish & Wildlife Service
11:00 AM - 11:20 AM	*Improvements in Effluent Water Quality Within the Pennsylvania Fish and Boat Commission's State Fish Hatchery Program* **Brian Wisner**, Pennsylvania Fish and Boat Commission
11:20 AM - 11:40 AM	*Demographic Processes Influence Genetic Patterns of an Undescribed Redhorse* **Gregory Moyer**, Mansfield University

Friday, February 12th	
11:40 AM - 12:00 PM	Student Awards
12:00 PM - 1:00 PM	Lunch on your own

Susquehanna River Heartland Coalition for Environmental Studies Special Presentation Series	
1:00 PM – 1:30 PM	*Contribution of Lycoming College's Clean Water Institute to the Pennsylvania Fish and Boat Commission's Unassessed Waters Project (2010 – 2015)* **Mel Zimmerman**, Lycoming College
1:30 PM – 2:00 PM	*Artificial In-stream Habitat Structures for the Eastern Hellbender Salamander* **Peter Petokas**, Lycoming College
2:00 PM – 2:30 PM	*Brook Trout Population and Age Structure Recovery from a Catastrophic Flood in North Central Pennsylvania* **Jonathan Niles**, Susquehanna University
2:30 PM – 3:00 PM	*The Diet of Crayfish in the Susquehanna River: A Preliminary View* **Michael Bilger**, Susquehanna University
3:00 PM – 3:30 PM	**Steve Rier**, Bloomsburg University

Panel Discussion	
3:30 PM – 4:30 PM	**State of the Susquehanna River: Future Research Needs and Direction**

Abstracts

Technical Session #1

Thursday, February 11th

2:00 PM – 4:20 PM

Causal Analysis of the Smallmouth Bass Decline in the Susquehanna and Juniata Rivers

Dustin Shull[1]*, Geoffrey Smith[2], Josh Lookenbill[1], and Susan B. Norton[3]

Unusual mortality events of smallmouth bass (SMB) have been observed in the Susquehanna River Basin annually since 2005 and have coincided with a decline in recruitment of young-of-year fish into the adult SMB population. In 2014, the Pennsylvania Department of Environmental Protection (PADEP) in cooperation with the Pennsylvania Fish and Boat Commission (PFBC) initiated an effort to synthesize the large body of potentially relevant publications, data, and analyses. U.S. EPA's stressor identification process (CADDIS (www.epa.gov/caddis)) was selected for the assessment because it provides transparency and reduces bias without restricting the types of evidence used. Over 50 analytical worksheets comprising almost 400 pages describing data collections and analyses were developed and evaluated by experts over the course of three workshops. The causal assessment successfully narrowed the scope of concerns and will be used to guide future studies and management of the Susquehanna and Juniata Rivers.

[1] Pennsylvania Department of Environmental Protection
[2] Pennsylvania Fish and Boat Commission
[3] United States Environmental Protection Agency

Comparing Drivers of Smallmouth Bass Reproduction and Recruitment in the Susquehanna River and Other Large Pennsylvania Rivers

Geoffrey Smith, Division of Fisheries Management, Pennsylvania Fish and Boat Commission

Several factors affect Smallmouth Bass reproduction and recruitment in large river systems. A number of these factors have been reviewed as part of the recent Causal Analysis/ Diagnosis Decision Information System (CADDIS) focusing on declines in abundance of Smallmouth Bass at the Susquehanna and Juniata Rivers. The CADDIS process provided a unique opportunity to conduct a number of interesting analyses into the roles that these factors play in riverine Smallmouth Bass populations in Pennsylvania. We will discuss how two such factors, stream discharge and disease, affect reproduction and recruitment in the Susquehanna River and other large river systems in Pennsylvania.

Investigation of Smallmouth Bass Population Genetic Structure in the Susquehanna River Basin

Schall, M.K.[1, 2*], T. Wagner[4] ,V.S. Blazer[3], M.L. Bartron[5], and T. Wertz[6]

There have been concerns about decreases in abundance of smallmouth bass (*Micropterus dolomieu)* in the Susquehanna River basin, with declines being attributed to poor recruitment into the adult smallmouth bass population. Since the initial declines in abundance of adult fish and more recent observations of disease and mortality of juvenile fish, a wide range of potential environmental stressors have been identified as potential contributing factors, including pathogens, water quality, and contaminants. Recent radio telemetry research on smallmouth bass has documented the importance of both tributary and river main-stem habitat in the Susquehanna River for completing essential life-history requirements. Additionally, the radio-telemetry study demonstrated intermixing of tributary and river-tagged fish, but population-level implications (i.e., gene flow) of these movements are unclear. To gain insight on how smallmouth bass are genetically structured in the Susquehanna River basin, we completed a population genetics study. Tissue samples were collected from 24 sites within the Susquehanna River basin and one out of basin site (the Allegheny River). The overall goal of this research was to assess connectivity and genetic population structure from both tributary and river sites across the Susquehanna River basin, and to determine how the Susquehanna River basin sites genetically compare to an out of basin site. A total of 1,034 fin clips were collected during the spring of 2015 for genetic analysis. These samples were collected during pre-spawn conditions and were analyzed with microsatellite markers to investigate differences within and among populations. Results indicate a lack of genetic structure between sites within the Susquehanna River basin (mean pairwise F_{ST} = 0.01). The Allegheny River site, in general, was the most different from sites within the Susquehanna River basin. Additionally, within the Susquehanna River, a small number of sites, including one of the most isolated sites, were significantly different from several other sites (mean pairwise F_{ST} =0.03), but combined with other metrics of differentiation, were not sufficiently different to be considered separate populations. Overall, our results provide insight on the connectivity and genetic structure of smallmouth bass in the Susquehanna River basin, and may prove useful for informing fisheries management decisions and for investigations into the potential role disease and contaminants play in poor recruitment events.

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[6] Pennsylvania Department of Environmental Protection, Rachel Carson State Office Building, 400 Market Street, Harrisburg, PA 17101 twertz@pa.gov

Migratory Fish Restoration in the Susquehanna River

Sheila Eyler, United States Fish and Wildlife Service

Historically, the Susquehanna River supported large populations of migratory fish, including American Shad, river herring and American Eel, but those populations have declined with the construction of dams restricting access to spawning and nursery habitat. Resource Agencies have been implementing efforts to restore migratory fish to the river dating back to the mid-1800s, and those levels have been met with varying levels of success. Since the 1960's, a multi-state and federal group, currently known as the Susquehanna Anadromous Fish Restoration Cooperative, spearheaded a large scale restoration program, primarily focused on American Shad. Restoration efforts included stocking juvenile shad, trap and transporting adults around the mainstem dams onto the spawning grounds and directing the four hydroelectric dams on the lower 60 miles of the mainstem to provide fish passage facilities. This intensive restoration program culminated with peak American Shad passage at the Conowingo Dam in the early 2000s, followed by a steady decline in passage through 2015. The cessation of the trap and transport program, reductions in shad fry stockings, and poor upstream passage efficiency at the mainstem dams have attributed to the current poor passage numbers at Conowingo Dam. In an effort to reinvigorate restoration, efforts to improve fish passage have recently occurred at Holtwood Dam, with improvements to fish passage facilities at York Haven Dam and Conowingo Dam to be coming in the future. Trap and transport of American Eel passage has also been initiated to support restoration of that species.

Re-Introduction Efforts and Current Status of American Eel in the Susquehanna River Basin

Aaron Henning – Aquatic Biologist – Susquehanna River Basin Commission

Under the guidance of The Susquehanna River Anadromous Fish Restoration Cooperative (SRAFRC) and using the Federal Energy Regulatory Commission's (FERC) re-licensing process, resource agencies and hydroelectric project operators have begun an effort to re-introduce the native American eel (*Anguilla rostrata*) to the Susquehanna River Basin. Volitional upstream passage of American eel to the watershed has been restricted by the presence of hydroelectric dams on the lower Susquehanna River since the early 20th century. Trap and transport efforts have successfully resulted in over 558,000 eels being stocked upstream of the hydroelectric projects since 2008. Trap and transport of American eel will continue through 2030 or until volitional passage at Conowingo Dam is achieved. Stocking success has demonstrated by rapid growth and dispersal of transported eels. The Susquehanna River Basin Commission (SRBC) will monitor the ecological impacts of American eel on resident fish and macroinvertebrate communities.

Evaluation of Macroinvertebrate Communities in Exceptional Value and High Quality Streams within the Marcellus Shale Region of the Susquehanna River Basin

Luanne Steffy, Susquehanna River Basin Commission

The Susquehanna River Basin Commission initiated the Remote Water Quality Monitoring Network (RWQMN) in 2010, to monitor impacts of the Marcellus Shale unconventional natural gas industry on streams in the northcentral Pennsylvania (PA) portion of the Susquehanna River Basin using continuous monitoring technology. This network has since expanded to include biological sampling. Of the 59 RWQMN sites, 23 are located on stream segments currently designated as Exceptional Value (EV) or High Quality (HQ) by the PA Department of Environmental Protection (PADEP). The objective of this work was to evaluate the current status of macroinvertebrate communities at sites within the RWQMN designated as EV or HQ and identify any correlation to unconventional natural gas drilling. Additionally when possible, the samples collected in 2015 were compared to analogous samples (i.e. same stream, index period and methods) collected prior to 2010. Macroinvertebrate sampling was completed, using standard PADEP protocol, at all sites in April – May 2015 to correspond with index period requirements for EV and HQ streams. Data illustrate that macroinvertebrate communities at a majority of these sampled EV and HQ sites fall within reference ranges for each metric and results are not correlated with the presence or absence of unconventional natural gas drilling within the watershed. Four sites repeatedly did not meet reference range criteria, however these samples were similar to samples collected before 2010. Comparisons of community similarity of pre-2010 samples to current samples revealed a high degree of resemblance between most samples. These data suggest that there has not been measureable degradation of macroinvertebrate communities at EV and HQ sites within the RWQMN during this time period.

Use of in-situ mussel cages to assess the effects of water quality on native mussel populations

Kathleen Patnode, Unites States Fish and Wildlife Service.

We examined the effect of high salinity wastewater (brine) from oil and natural gas drilling on freshwater mussels in the Allegheny River, Pennsylvania, during 2012. Mussel cages (N = 5 per site) were deployed at two sites upstream and four sites downstream of a brine treatment facility on the Allegheny River. Each cage contained 20 juvenile northern riffleshell mussels *Epioblasma torulosa rangiana*). Continuous specific conductance and temperature data were recorded by water quality probes deployed at each site. To measure the amount of mixing throughout the entire study area, specific conductance surveys were completed two times during low-flow conditions along transects from bank to bank that targeted upstream (reference) reaches, a municipal wastewater treatment plant discharge upstream of the brine-facility discharge, the brine facility, and downstream reaches. Specific conductance data indicated that high specific conductance water from the brine facility (4,000–12,000 µS/cm; mean 7,846) compared to the reference reach (103–188 µS/cm; mean 151) is carried along the left descending bank of the river and that dilution of the discharge via mixing does not occur until 0.5 mi (805 m) downstream. Juvenile northern riffleshell mussel survival was severely impaired within the high specific conductance zone (2 and 34% at and downstream of the brine facility, respectively) and at the municipal wastewater treatment plant (21%) compared to background (84%). We surveyed native mussels (family Unionidae) at 10 transects: 3 upstream, 3 within, and 4 downstream of the high specific conductance zone. Unionid mussel abundance and diversity were lower for all transects within and downstream of the high conductivity zone compared to upstream. The results of this study clearly demonstrate in situ toxicity to juvenile northern riffleshell mussels, a federally endangered species, and to the native unionid mussel assemblage located downstream of a brine discharge to the Allegheny River.

Abstracts

Technical Session #2

Friday, February 12th

8:00 AM – 10:00 AM

Evaluation of Channel Catfish Spawning Success using Pennsylvania Channel Catfish Spawning Boxes

Ben Page, Division of Habitat Management, Pennsylvania Fish and Boat Commission

Since the early 1990's, the Pennsylvania Fish & Boat Commission (PFBC) has placed wooden channel catfish spawning boxes in several reservoirs in an effort to encourage natural reproduction in stocked channel catfish waters. From 2012 to present, multiple monitoring techniques have been used to document channel catfish reproduction in the boxes at five different Pennsylvania reservoirs. Monitoring at all five reservoirs showed that greater than 50% of the boxes were utilized at least once for spawning. At one reservoir 92% of the boxes hosted at least two spawning events in one season (May-August). The PFBC has now implemented a study plan at five reservoirs to measure the amount of channel catfish offspring from boxes that survive one to five years (<450 mm).

Examination of aSsingle-unit, Multiple Pass Electrofishing Protocol to Reliably Estimate Fish Assemblage Composition in Wadeable Streams of the Mid-Atlantic, USA

Matthew K. Shank[a]* Aaron M. Henning[a], & Andrew S. Leakey[a]

Electrofishing is a valuable tool to collect fish assemblage data, which is often vital to ecological assessments. Previous research has shown that wadeable electrofishing protocols vary in optimal reach length and number of passes based on study objectives, stream size, and geographic region, among other factors. This study examined a method intended to efficiently assess fish assemblage composition through use of a single unit, width based electrofishing protocol utilizing multiple passes. Fish assemblage data were collected using backpack or tote barge electrofishing equipment from 93 wadeable streams 2.3 – 76.4 m in width in the Susquehanna River Basin. Results indicated that > 97% of total species present were collected after the first two electrofishing passes, regardless of stream size. New species were more often captured on subsequent electrofishing passes in larger streams. Results suggest less electrofishing effort is necessary to accurately estimate fish assemblage composition in smaller streams in this study, and in more depauperate ichthyofaunal regions when compared with other studies. A single electrofishing pass satisfied the objective of obtaining ≥ 90% assemblage similarity in small streams ≤ 5 m wide. Two electrofishing passes were necessary to reach ≥ 90% assemblage similarity in larger wadeable SRB streams > 5 m in width. Results suggest a single electrofishing unit and a crew of ≤ 4 individuals can obtain reliable estimates of assemblage composition from wadeable streams of various sizes, which may be desirable when personnel or gear is limited. The shortcomings of single-unit, multiple pass electrofishing (e.g. inability model abundance/species richness) reinforce the need for managers and researchers to choose electrofishing protocols based on study objectives. Overall, results suggest that the single-unit, multiple pass protocol performed throughout a reach equal to ten times stream width is appropriate to reliably estimate fish assemblage composition in mid-Atlantic and northeast USA streams.

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The Propagation and Management of Brown Trout (*Salmo trutta*) in the Pennsylvania Waters of Lake Erie

Allen Keim, Division of Fish Production Services, Pennsylvania Fish and Boat Commission

The focus of this presentation will deal with the history (failure and success), management, and future of the put-grow-take Brown Trout (BNT) fishery in the Pennsylvania waters of Lake Erie. This presentation will describe the Fish Production (state hatcheries and cooperative nurseries) and Fish Management goals and objectives for a trophy near shore Brown Trout fishery, as well as the most current results and data. The program was established in 2009, the first BNT were stocked into the Lake Erie Watershed in September of the same year. Certified disease free/disease resistant BNT eggs were received from the New York State Department of Environmental Conservation (NYSDEC) to start the program, with an annual goal of 100,000 yearling BNT stocked into the tributaries of Lake Erie and the lake itself. The cooperative nurseries in Erie County were included in the initial management plan as a supplement to the Pennsylvania Fish and Boat Commission (PFBC) state hatchery stocking, with an initial stocking of BNT in numerous tributaries to Lake Erie. The cooperative nurseries involvement with the program has grown each year, culminating with 100% of the BNT stocking in 2015 and beyond. Fisheries Management data collection has shown improving catches and positive trends of "trophy" BNT, mainly through gill nets and steelhead (*Oncorhynchus mykiss*) brood stock collection. Catch and Harvest data from the program is used to monitor BNT populations and also helps monitor age, growth, and diet of BNT. Results of this data show a promising future for the BNT in the PA Waters of Lake Erie.

The Hunters Station Bridge Replacement Project: Quality Assurance/ Quality Control of Salvage operations for Threatened and Endangered Freshwater Mussel species in the Allegheny River

Eric J. Chapman*, Ryan Miller, Danielle Rihel, Alysha Trexler, and Mary Walsh, Western Pennsylvania Conservancy

The Hunter Station bridge replacement project is turning out to be one of the largest freshwater mussel relocation projects in United States history. Numerous partners have assembled to relocate a monumental number of common and federally endangered freshwater mussel species from the Allegheny River in Forest County, Pennsylvania to numerous locations across the United States. Freshwater mussels are being salvaged from over 100 cells (which are 5m x 5m) to minimize impacts to these imperiled animals when bridge demolition and new pier construction begins in the near future. Once mussels are collected they are measured, tagged, and processed for shipment to receiving states. Since the projects' inception in July 2015, we have relocated over 38,000 freshwater mussels to several states including Ohio, West Virginia, Kentucky, Illinois, and Indiana. The goal of this presentation is to discuss freshwater mussel salvage efficiency, population densities, and lessons learned since the projects inception.

Updating the AFS policy statements for conserving rare, threatened and endangered aquatic species

Patrick D. Shirey[1*], Leanne H. Roulson[2], and Thomas E. Bigford[1]

Abstract: Over the last few decades the fisheries profession made substantial advances in the science and management of species at risk of extinction. However, marine and freshwater species have faced increasing threats of habitat destruction, environmental change, and political opposition during this same time period. Therefore, the AFS leadership decided to update the policy statements on rare, threatened and endangered species as part of the inaugural policy fellowship. Our task is to (1) combine three previous policy statements (AFS Policy Statements #10; #19; and #27) into one document, and (2) update the statement with recent scientific advances and examples. We highlight success stories of collaborative efforts to improve the status of imperiled species, including the delisting of the Oregon Chub *Oregonichthys crameri* and Modoc Sucker *Catostomus microps*, and the construction of breeding, research, and education facilities that mimic the natural environment. To make recovery possible, history of recovery efforts shows that patience (>20 years), commitment to adequate funding, and collaborative efforts are paramount to achieve objectives that result in a successful recovery. When completed, we hope the review will provide scientists, managers, policymakers, and educators in the fisheries profession with a policy tool to implement best scientific practices for at-risk aquatic species. In our presentation we will discuss the process of updating the policy statement, what we have achieved in our review of the literature, and a timeline for review of our draft by the AFS membership.

Affiliations:
1. American Fisheries Society, Bethesda, MD
2. HydroSolutions, Inc., Bozeman, MT

Small Investment Abandoned Mine Drainage Treatment Projects for Large Scale Brook Trout Restoration

Thomas J. Clark, *Mine Drainage Program Coordinator, Susquehanna River Basin Commission*

In 2014, the Susquehanna River Basin and the Indiana County Conservation District completed a nine-phase abandoned mine land reclamation and drainage treatment project in the Bear Run Watershed, a tributary to the West Branch Susquehanna River in the northeast corner of Indiana County. Those projects returned native brook trout populations to a 19 square mile watershed and just recently removed five miles from the Integrated List of Impaired Waters, for an investment of around $2 million. SRBC anticipates that additional mileage will be removed through a public-private partnership that is remining and reclaiming other areas beyond the scope of traditional treatment due to diffuse discharges.

Due to the success of Bear Run, SRBC began to search for other mine drainage impacted streams that had areas of wild trout recolonization potential that could be returned with a small reclamation and/or treatment investment. Through an initial screening, two streams were selected for advancement; Drury Run and Birch Island Run, tributaries to the West Branch Susquehanna River both located in Clinton County. Treatment system designs are in progress on both projects which when completed, will remove significant impaired stream mileage while at the same time restoring wild brook trout habitat for recolonization, all for a very small investment from the Commonwealth.

Many additional small investment/large return opportunities exist similar to Bear Run, Drury Run, and Birch Island Run that should be considered for future funding based upon the success of the described screening model.

Abstracts

Technical Session #3

Friday, February 12th

10:20 AM – 11:45 AM

Spatial and Predicted Outcomes of Watershed Restoration in an AMD-impacted Watershed

George. T. Merovich Jr.[1], Andrew S. Watson[2], J. Todd. Petty[3], and Brady Gutta[4]

We evaluated predicted outcomes of acid mine drainage (AMD) remediation at the watershed scale for Abram Creek, a small sub-watershed of the North Branch of the Potomac River near Kitzmiller, Maryland. Before and 3 years after AMD treatment, we surveyed water chemistry, benthic macroinvertebrates, and fishes in AMD-impacted streams, AMD-treated streams, and unimpaired reference streams. We used these data to quantify ecological loss from AMD, to estimate the degree of recovery expected through restoration, and to quantify post-restoration recovery. At the stream-level scale, AMD-impacted streams improved noticeably with treatment. Dissolved metals and acidity declined, but conductivity and sulfate levels remained elevated. Ephemeroptera-Plecoptera-Trichoptera genera increased in treated streams, but remained lower than reference streams. Fish re-colonized most AMD treatment sites that lacked fish beforehand. Community-level analyses indicated improved but altered assemblages with AMD treatment. Changes were correlated to larger scale conditions. At the watershed scale, pre-restoration conditions indicated that only 30% of the historic fishery existed. Restoration was expected to recover 66% of the historic fishery value, but only 52% had been recovered 3 years post treatment. Development of watershed models at multiple spatial scales to estimate expected recovery potential provides a way to evaluate restoration success.

1. Presenting author, Juniata College, Department of Environmental Sciences and Studies
2. Peace Corp Peru
3. West Virginia University, School of Natural Resources
4. Antero Resources

Aquatic Conservation Activities at the U.S. Fish & Wildlife Service's Northeast Fishery Center

Michael J. Millard, U.S. Fish & Wildlife Service, NE Fishery Center, Lamar, PA

Located in Lamar, PA, the U.S. Fish & Wildlife Service's Northeast Fishery Center consists of a Fish Technology Center, Fish Health Center, and the Population Ecology Branch. The Center's mission is to develop and transfer technology and scientific expertise in the fields of fish culture, fish health, population monitoring & assessment, and conservation genetics. Aquatic scientists at the Center seek to better understand aquatic resources and their ecosystems and to assist resource managers in making sound decisions that build sustainable fisheries, recover endangered and threatened species, and sustain healthy ecosystems and habitats throughout the northeastern United States and along the Atlantic coast. This presentation will provide an update on current activities at the Center, as well as emerging capabilities being developed in order to meet evolving demands in aquatic resource conservation. New applications and technologies in conservation genetics (eDNA and NextGen sequencing), as well as captive experimentation with non-traditional aquatic species are included in the Center's near term activities.

Improvements in Effluent Water Quality within the Pennsylvania Fish and Boat Commission State Fish Hatcheries

Brian Wisner, Director, Bureau of Hatcheries, Pennsylvania Fish and Boat Commission

The Pennsylvania Fish and Boat Commission (PFBC) operates 14 state fish hatcheries which produce a variety of fish species for stocking into the waters of the Commonwealth. The eight PFBC trout hatcheries currently produce an annual average of 3.2 million adult trout weighing approximately 1.9 million pounds plus about two million fingerlings. As part of the production process, hatchery effluent water is managed to reduce potential impacts on the receiving waterways. Hatchery influent and effluent have been sampled at PFBC trout hatcheries for decades. Results from total suspended solids (TSS) sampling at the five major trout hatcheries during 2003 through 2014 are presented. This represents a period of improvements in hatchery effluent quality through best management practices, improved water flow management and installation of microscreen filtration. During this time, total annual pounds of TSS were reduced by over 60%. The PFBC continues to seek reductions in TSS and improve hatchery effluent water quality.

Demographic Processes Influence Genetic Patters of an Undescribed Redhorse

Gregory R Moyer, Department of Biology, Mansfield University

Members of Catostomidae and in particular *Moxostoma* (the redhorse suckers) comprise a large portion of ichthyofauna of the southeastern United States. Unfortunately, the physical alteration of their habitat has adversely affected the persistence of numerous catostomid species and population. Recently, there has been a number of newly discovered *Moxostoma* species in the southeast including the undescribed sicklefin redhorse. Genetic data was used to confirm the existence of three populations of sicklefin redhorse (Hiwassee, Tuckasegee, and Little Tennessee); however, evidence of straying between the Tuckasegee and Little Tennessee populations appears ongoing. This finding is perplexing, given that migration between populations should homogenize the populations; yet, the two populations appear genetically distinct. Approximate Bayesian Computation was used to compare competing models of demographic history to elucidate the observed level of genetic diversity within and among the Tuckasegee and Little Tennessee populations of sicklefin redhorse. A model that simulated the migration out of the Tuckasegee during the years when tannery operations were present was favored over models that included recent population reductions in the Tuckasegee or continued migration between the Tuckasegee and Little Tennessee rivers. Results suggest that tannery operations during the 1900s may have influenced the behavior and observed genetic structure found presently in sicklefin redhorse.

The Susquehanna River Heartland Coalition for Environmental Studies

Special Presentation Series

Friday, February 12th

1:00 PM – 3:30 PM

Contribution of Lycoming College CWI to the PFBC Unassessed Waters Project (2010-2015)

Mel Zimmerman, Department of Biology, Lycoming College

This is the 6th year that Lycoming College CWI has participated with PA fish and Boat Commission in the Unassessed Waters Project. In 2010, Lycoming was one or two college partners with the PA Fish and Boat Commission on the unassessed waters project. College/University/watershed partners now number 15. To date, the CWI team has completed a total of 399 streams in the Loyalsock, Lycoming, and Pine Creek Watersheds (about 16% of the total amount of streams sampled for this project). In the past 3 years, streams in the Genesee, Alleghany, White Deer Hole Creek, Black Hole Creek, Quenshukeny, Pine Run, and Antes Creek watersheds, as well as unnamed tributaries in Tioga County have been completed. Data for this project has been logged into the PFBC Unassessed Waters Data set for consideration of trout stream protection. The number of class A, B, C, D, and E streams from each watershed will be presented. On average, 47% of the streams sampled support wild trout and nearly 20% are considered class A or B trout streams. In 2015, Lycoming College sampled 38 streams in total, 17 were dry and 12 had wild trout. A breakdown of the benefit and limitations of this program will be presented.

Artificial In-stream Habitat Structures for the Eastern Hellbender Salamander

Peter J. Petokas*, Clean Water Institute and Department of Biology, Lycoming College, Williamsport, PA; Christopher D. Yearick and James Curatolo, Upper Susquehanna Coalition, Owego, NY

Population declines have been taking place throughout the entire geographic range of the eastern hellbender salamander (*Cryptobranchus a. alleganiensis*) in North America. The declines and local extinctions have led to multiple head-starting programs to augment or restore hellbender populations. Once widespread throughout the Susquehanna River basin, the eastern hellbender is now severely-restricted in geographic distribution. To facilitate the collection of fertilized eggs for a nascent head-starting program for the Susquehanna River watershed, we installed 17 artificial habitat structures (bender huts) in local streams during the summer of 2014 and 20 additional bender nuts during the summer of 2015. The bender huts were made using fiberglass-reinforced concrete hand-packed over a wooden form. When the concrete had dried sufficiently, the wooden form was knocked out to create a shallow internal chamber. A four-inch ABS plastic coupling was added to the top center of the concrete hut and a three-inch coupling to one side. The top fitting accepts a screw-in cap for easy access to the internal chamber for egg collection and sediment removal. The side fitting accepts a three-inch section of ABS pipe to provide an elongate entryway for hellbender access to the internal chamber. Although weighing a hefty 27 kg, the concrete boxes are easily carried or floated to installation sites. Each bender hut was placed atop a clean, flat gravel bed in water depths averaging 0.5m with slow or moderate flows. Each concrete hut was then covered with large, flat boulders, leaving only the access tunnel visible. In the early fall of 2015, we observed hellbender egg clutches inside two of the bender huts and collected a portion of one clutch for the head-starting program. By late fall 2015, we found that 20% of the huts were occupied by adult eastern hellbenders.

Brook Trout Population and Age Structure Recovery from a Catastrophic Flood in North Central Pennsylvania

Jonathan Niles, Freshwater Research Initiative, Susquehanna University

In early September 2011, Tropical Storm Lee deposited over twelve inches of rain in the Loyalsock Creek watershed (north Central Pennsylvania). Trees were uprooted, new substrate material was deposited and stream biota were decimated in this flooding event with peak flows reaching ~69,000 CFS. As part of the PA Fish and Boat Commissions Unassessed Waters Initiative, pre-flood brook trout populations were sampled in summer 2011 at 30 headwater stream study sites. Post flood samples were collected each summer at these sites between 2012 and 2015. After the September 2011 flood, results show the removal of most brook trout below 150mm in size across most study sites. Results show 2012 yielded a large age-0 class, with low numbers of fish between 100 and 150mm in size. Results from 2013 show high recruitment of age-0 brook trout into the age-1 year class, but there is continued low numbers of older fish. 2014 and 2015 yielded larger adult populations than previous years as young fish recruited into older age classes. Results also show a decrease in the amount of age-0 fish since 2012. Results indicate that the age structure is recovering to pre-flood levels but was greatly affected for several years after the flood.

The Diet of Crayfish in the Susquehanna River: A Preliminary View

Michael D. Bilger*[1], Dr. Brian P. Mangan[2], Sean P. Reese[3], Robert H. Michener[4],

Objectives: Our objectives were to determine a) the diet of crayfish in the Susquehanna River, b) if diet varied between the two species of crayfish (the rusty crayfish *O. rusticus* and the Allegheny crayfish *O. obscurus*) in the river, and c) if the diet of crayfish varied between the sampled locations in the river.

Methods

- Crayfish were collected by hand and by baited wire traps, and were preserved in ethanol.
- Crayfish stomachs were dissected and sub-sampled by categories of crayfish total length to compare the contents and volumes among the sites sampled
- Collections were completed to perform stable isotope analysis on crayfish and macroinvertebrate samples to determine crayfish diets among the sites

Principal Results

- The stomachs of some 1400 crayfish that were collected at 11 river locations in 2013 were dissected for potential contents and volume analysis
- The stomachs of some 451 crayfish that were collected at 7 river locations in 2015 were dissected for potential contents and volume analysis
- Six sites were chosen to compare 2013 and 2015 collections across high and low density sites- Harding, Retreat, Bell Bend (Berwick) were low density; Sunbury, Boile Run, and Great Bend (Halstead) were considered high density
- Crayfish collected at Great Bend in 2013 only were also included
- Goal was to collect thirty crayfish including two major total length categories picked randomly from each sample and analyzed for stomach contents and volume at each of the sites for 2013 and 2015
- Greater than 30 taxa of macroinvertebrates have been identified from the total number of stomachs examined

Conclusions

- Differences and similarities of stomach contents and volumes are currently being analyzed for the selected sites for 2013 and 2015
- Stable isotope analysis is underway

Affiliations:

1. *Susquehanna University, Freshwater Research Initiative*
2. *Kings College, Program Director of Environmental Science and Biology*
3. *Susquehanna River Initiative, Bucknell University*
4. *Boston University, Stable Isotope Laboratory*

Panel Discussion:

State of the Susquehanna River
Future Research Needs and Direction

Friday February 12th

3:30 PM – 4:30 PM

Panel Participants include:

Melvin Zimmerman, Ph.D. – Professor of Biology and Director of the Clean Water Institute at Lycoming College in Williamsport, Pennsylvania.

Dr. Zimmerman has been teaching for 26 years and is the Lowry Professor of Biology at Lycoming College. He also directs the Environmental Sciences Program where he teaches courses in Ecology, Aquatic Biology and Invertebrate Zoology. His research interests include stream ecology and restoration as well as wastewater biology. As Director of the Clean Water Institute, Dr. Zimmerman along with local watershed groups focus primarily on the water quality and health of the aquatic ecosystems in the West Branch of the Susquehanna River including its major tributaries: Pine Creek, Lycoming Creek, Loyalsock Creek and Muncy Creek. Dr. Zimmerman is also a cooperator in the Pennsylvania Fish and Boat Commission's Unassessed Water Program. Since 2010, he and his students have sampled nearly 400 waterways in an effort to describe previously undocumented fish communities and identify waterways which support native or naturalized populations of salmonids.

Peter Petokas, Ph.D. – Research Associate at Lycoming College's Clean Water Institute in Williamsport, Pennsylvania.

Dr. Petokas's work at the Clean Water Institute is primarily focused on incorporating elements of Natural Stream Channel Design into stream restoration projects aimed at stabilizing banks and reducing sedimentation. He works closely with members of the Keystone Stream Team, a multidisciplinary group of academics, hydrologists, geologists, engineers, stream designers, and Watershed Association members. Current projects include the development of an inventory of stream restoration projects in Pennsylvania and constructing an online database of reference reach data. Additionally, Dr. Petokas research interests include the reproductive biology of freshwater turtles, salamander ecology and Eastern Hellbender restoration.

Jonathan Niles, Ph.D. – Director of the Freshwater Research Initiative at Susquehanna University in Selinsgrove, Pennsylvania.

Dr. Niles is the Director of the Freshwater Research Initiative at Susquehanna University where many of his research efforts focus on documenting fish assemblages in headwater streams across central Pennsylvania. Some of his recent research has focused on the recovery of Brook Trout populations in streams severely impacted by Tropical Storm Lee in 2011. Dr. Niles is also a contributor to the Pennsylvania Fish and Boat Commission's Unassessed Waters Program where he and a team of student interns have sampled over 600 streams documenting fish and aquatic macroinvertebrates communities since 2011. Other research being conducted at Susquehanna University includes assessing the age and growth of channel catfish throughout the Susquehanna River basin as well as future plans to sample young of the year smallmouth bass for deformities.

Michael Bilger, M.S. – Research Associate at the Freshwater Research Laboratory at Susquehanna University,

Throughout his career, Mr. Bilger has been an aquatic ecologist interested in the life history and taxonomy of freshwater invertebrates. In 1974, he began his career as an Aquatic Biologist for the Massachusetts Division of Water Pollution Control. Since that time he has worked for many organizations including the U.S. Geological Survey, Pennsylvania District where he conducted extensive field work in the Susquehanna and Delaware River basins as part of the NAWQA program. In 2014 he accepted a position at the Freshwater Research Initiative, Susquehanna University as a Research Aquatic Scientist. He is currently studying the diet of two invasive crayfish species to assess the impacts these invaders may have on the ecology of the river. Additionally, his research interests include fisheries science, water chemistry, and pollution ecology.

Steven Rier, Ph.D. – Associate Professor of Biology at Bloomsburg University in Bloomsburg, Pennsylvania.

Dr. Rier teaches courses in Limnology and Freshwater Biology at Bloomsburg University. His research interest include many aspects of stream ecology but focus mainly on the role that microorganisms such as algae, bacteria, and fungi play in regulating stream ecosystem function and how human impacts can alter these dynamics. His lab is currently engaged in several projects that focus on the role stream microorganisms play in stream nutrient dynamics and ultimately the export of these nutrients to larger rivers and estuaries. He is specifically interested in how stream algae and bacteria respond to pulses of nutrients associated with runoff and how adjacent land-use modifies these responses. Some of his local efforts include the development of a real-time water quality monitoring station on Fishing Creek near Bloomsburg Pennsylvania.

Brian Mangan, Ph. D. – Director of the Environmental Science Program and Professor of Environmental Sciences and Biology at King's College in Wilkes-Barre, Pennsylvania.

Over the last thirty years, Dr. Mangan has actively been involved in studying the Susquehanna River as either and academic or private consultant. Because of this long history, his research interests cover a wide range of disciplines including entomology, environmental contamination and fisheries sciences. Most recently, his research has focused on invasive species introduction and control as well as environmental contamination monitoring. Currently, he has obtained funding to study the introduction and expansion of the invasive Rusty and Allegheny Crayfishes in the Susquehanna River as well as the influences these two species may have on the health of the aquatic community.

Abstracts

Poster Session

Thursday, February 11th

6:00 PM – 9:00 PM

Assessment of Fish and Macroinvertebrates Assemblages on Cucumber Run and its North Branch

Nathan J.C. Backenstose, California University of Pennsylvania

Pennsylvania has experienced widespread water quality degradation over the years attributable to a variety of cultural stressors The purpose of this study was to assess macroinvertebrate and fish assemblages in Cucumber Run and its main fork, the North Branch. Water quality surveys taken in 2014 suggested that while these two streams were in close proximity to one another, their chemical composition differed markedly and by extension their biological communities would also differ. Results of this preliminary investigation indicate that iron is more prevalent and conductivity appreciably higher in the North Branch of Cucumber Run than in its mainstem. Given the dissimilarity of chemical parameters between branches this may account for reductions in fish and macroinvertebrate abundance within the North Branch. Only a single species of fish was found in the electrofishing survey with abundance slightly depressed in the North Branch. Macroinvertebrate communities in contrast had greater family richness and relative abundance in the North Branch. Future studies could be done to investigate the role that habitat/substrate play in the maintenance of aquatic communities here as well as to determine methods to reduce iron loading in this basin.

Marcellus Shale Impact on In-stream Leaf Decomposition Via Sedimentation Across a Gradient of Land Use

Jordan Barton, Matthew McTammany; Meghan Reilly, Bucknell University

The rapid development of hydrofracking has greatly outpaced ecological research trying to assess potential impacts of natural gas drilling on the environment, specifically aquatic ecosystems. Increased sedimentation and contamination of streams from natural gas drilling could affect stream biota, resulting in altered rates of ecosystem processes, like leaf breakdown. We seek to determine the impact from natural gas drilling on in-stream leaf decomposition. To determine effect of Marcellus Shale activity on leaf decomposition and on biological components involved, we deployed leaf packs in seven sites representing a range of Marcellus Shale activity among different land uses including forest, agriculture, and human development. Breakdown rates were determined for maple and oak leaves deployed in coarse and fine mesh bags to assess the relative influences of microbial decomposition and macroinvertebrate feeding. In addition, physical and chemical variables were measured. Overall, we found the breakdown rates for all sites, mesh sizes, and leaf species to be higher in the presence of natural gas drilling. As expected, maple leaves broke down faster than oak leaves, and leaves incubated in fine mesh bags decomposed more slowly than leaves in coarse mesh bags. Across the land use gradient without Marcellus Shale influence, agricultural sites had higher breakdown rates than forested and developed areas. Higher breakdown rates in Marcellus Shale sites suggest that more disturbed land modifies hydrology of the stream systems, promoting more runoff into the stream as well as more sediment release. This increased sediment in combination with higher runoff may not bury the leaves as predicted but may increase the mechanical breakdown of leaf material due to high water velocity.

Comparing the Growth Rates and Population Parametrics of *Salvelinus fontinalis* of the Hammersley Fork and Cross Fork Stream Systems in the Kettle Creek Watershed

Clayton Good, Lycoming College; Dr. Shawn Rummel, Eastern Abandoned Mine Program Trout Unlimited and Dr. Mel Zimmerman, Lycoming College

Brook trout, *Salvelinus fontinalis*, were sampled in the Cross Fork and Hammersley Fork watersheds which are both tributaries to Kettle Creek in northcentral Pennsylvania. Growth rates were calculated using field measured lengths and weight, and aging scale samples that were analyzed in the lab. Growth rates were compared between fish in both watersheds as well as testing variables such as presence of crayfish and other fish species. Crayfish appeared to potentially have a negative impact on growth rates of brook trout, crayfish present 53mm/yr± 5.8, crayfish absent 57.0mm/yr±8.3 $p=.062$. Although this was not significant it provides a question that should be further researched, especially in first order headwater streams where there may be more interspecies competition for food sources.

Use of Invertebrate Samples as an Indicator of Stream Community Health in the Allegheny National Forest

Chris Rocco, Lock Haven University, H. Bechtold, N. Welker, C. Keeports, and S. Seiler.

We surveyed fish communities, benthic communities, and instream productivity from several streams to assess community health in the central portion of the Allegheny National Forest. During July and August of 2015, we visited 28 headwater stream locations near Chapman State Park and Sheffield, PA. We used kicknet samples to calculate density and diversity of macroinvertebrates as well as a family level biotic index. 100 meter long transects were electrofished to calculate fish density and fish lengths were used to calculate biomass. Most streams we visited show healthy invertebrate and fish Communities. Chlorophyll a values ranged between 0.012 – 16.0 ug/cm^2 at the sites. The majority of the chl a values were extremely low. We found no relationship between chl *a* and invertebrate diversity. The low algal biomass values and lack of relationship with invertebrates may suggest low nutrient concentrations and a diversity of invertebrates that consume detritus over algae. Our data will serve as a baseline for future monitoring of steam community and water quality across the Allegheny National Forest.

Poster Presentation Title: Surface area and prevalence of "blotchy bass" spots change over time in smallmouth bass (*Micropterus dolomieu*)

Kelsey Young[1*], Steven Seiler[1], Coja Yamashita[2], and Steve Davis[3]

Blotchy bass syndrome is the occurrence of black ink-like spots on the skin of *Micropterus* species. Despite several decades of knowing about the spots, no studies have formally monitored changes in spot prevalence on individual fish. The objective of this study is to observe and quantify blotchy bass spots in smallmouth bass to determine if the spots change over time. Thirty-one smallmouth bass (*Micropterus dolomieu*) were collected by angling from the West Branch Susquehanna River near Selinsgrove, PA, and transported to the Northeast Fishery Center at Lamar, PA. Twenty fish exhibiting spots and eleven fish showing no sign of spots were mixed into five tanks fed by spring water. To monitor changes in blotchy bass spots, we photographed each fish at biweekly or monthly intervals. Photographs from the beginning and end dates were observed to determine quantitative changes in blotchy bass spots. Changes in blotchy bass spots do not appear to show any correlation in early death of smallmouth bass. This study does not indicate a clear pattern to the changing in area of blotchy bass spots. Each tank contained a smallmouth bass that either lost area of spots on one or both sides and a bass that gained spots on one or both sides. Ongoing histological studies are being conducted to better understand the cause of blotchy bass syndrome and factors influence the expansion or reduction of spots.

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*The Executive Committee would like to say **THANK YOU** for your attendance at the Annual Technical Meeting and for your support throughout the year. We look forward to seeing everyone again next year.*