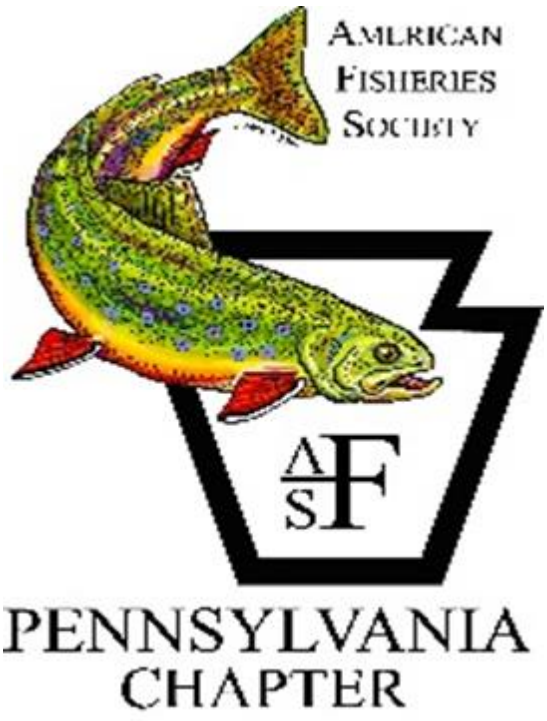
2018 SPRING TECHNICAL MEETING



The Pennsylvania Chapter of the American Fisheries Society

February 8th - 9th , 2018

Lycoming College, Clean Water Institute, Williamsport PA

JANE SHULTZ ROOM IN THE WERTZ STUDENT CENTER

Time	SCHEDULE
8:00	WELCOME AND INTRODUCTIONS: Tim Wertz
8:15	PLENARY: **Peter Tango** – Chesapeake Bay Monitoring Coordinator
	Fisheries and Fish Habitat Management Directions in the Chesapeake Bay and Watershed Through the Lens of the 2014 Watershed Agreement
	Coldwater and Diversity Session
8:45	**Kline, B., et al.** - Individual behavior influences habitat use in a thermally diverse environment in brook trout (*Salvelinus fontinalis*)
9:05	**Dowell, S., et al.** - Genetic assessment of Brook Trout populations in the Laurel Hill region of Pennsylvania
9:25	**White, S., et al.** - Quantifying hatchery introgression in wild brook trout populations in a northcentral Pennsylvania watershed
9:45	**Clark, K., and J.R. Stauffer, Jr.** - Distribution and abundances of French Creek Mussels
10:05	**Mueller, S., and J.R. Stauffer, Jr.** - Comparison of aquatic fauna among major Pennsylvania drainages
10:25	**BREAK**
	Environmental DNA
10:40	**Christman, P., et al.** - Confirmation of species identifications of Sculpin (*Cottidae*) species in South-Central PA
11:00	**Moyer, G.R., et al.** - Use of environmental DNA to detect aquatic species from Susquehanna and St. Lawrence basins
11:20	**Grassi, J., et al.** - Environmental DNA detection of American Eels
11:40	**Schroeter, J.C., et al.** - Expanding genetic resources to support species detection and biodiversity monitoring using environmental DNA
12:00	**LUNCH**
	Remediation and Biomonitoring
13:20	**Graves, J., et al.** - Potential negative outcomes from abandoned mine drainage remediation to an eastern brook trout (*Salvelinus fontinalis*) population: trade-off between isolation and invasion
13:40	**Stoklosa, A., et al.** - Effects of small dam removal on fish assemblage in Manatawny Creek; a preliminary examination of a 17-year study
14:00	**Thompson, T., et al.** - Groundwater as a source of emerging contaminants in the Chesapeake Bay
14:20	**Shank, M.** - Assessing the ecological recovery potential of a headwater stream after re-establishment of a conservation release

14:40	**Jewitt, A.** - Results from the 2017 Water Chestnut Chasers Challenge support early detection efforts in Pennsylvania
	Sport Fish Management
15:00	**Lorson, R., et al.** - A comparison of two methods to promote Pennsylvania catfish angling to urban anglers
15:20	**End of Technical Session - wrap up**

	Evening Events
15:40	**PA AFS Chapter Business Meeting**
16:10	**Fish Bowl Trivia - Tentative**
16:30	**Dinner - On Your Own**
18:00 21:00	**Poster Session and Social**

Friday February 9th

Workshops	
8:00-10:00 am and 10:15-12:00 pm	**Mussel Identification Workshop – Nevin Welte, Rick Spear, and Jordan Allison Atlantic Slope Species Identification (120 HEIM SCIENCE BUILDING)**
8:00-10:00 am and 10:15-12:00 pm	**Fish Kill Workshop – The USFWS Lamar Fish Health Center (JANE SHULTZ ROOM)**

Plenary Speaker Bio

Peter Tango

Chesapeake Bay Monitoring Coordinator

The bulk of Peter's career has been focused on natural resource science and management in the mid-Atlantic region. For the last 11 years has served as the Chesapeake Bay Monitoring Coordinator with USGS at the USEPA Chesapeake Bay Program Office. Before that he spent 10 years with the MD Department of Natural Resources working on water quality issues, often focused on Harmful Algal Bloom monitoring in Chesapeake Bay. Peter has a BS in Forest Biology and PhD in Fishery Science from the State University of New York College of Environmental Science and Forestry in Syracuse, NY, and squeezed in a MS in Wildlife Management from West Virginia University - Morgantown, WV. Between the M.S. and PhD in the late 1980s and early 1990s, in parallel with restoration work going that was going on in PA at the time, he worked on river otter restoration projects in WV, western VA and western NY. In his spare time these days, you can find Peter running throughout the Chesapeake Bay region where he lives, training on roads and trails, over mountains and through meadows, or camping, hunting or fishing somewhere.

Platform Presentation Abstracts

*** INDICATES A STUDENT PRESENTER TO BE JUDGED**

Individual behavior influences habitat use in a thermally diverse environment in brook trout (*Salvelinus fontinalis*)

Ben Kline [a, *], Shannon White [b], Nathaniel Hitt [c], Tyler Wagner [d]

[a] Department of Ecosystem Science and Management, Pennsylvania State University
[b] Pennsylvania Cooperative Fish and Wildlife Research Unit, Pennsylvania State University
[c] U.S. Geological Survey, Leetown Science Center, Kearneysville, WV, and
[d] U.S. Geological Survey, Pennsylvania Cooperative Fish and Wildlife Research Unit, Pennsylvania State University

Climate change is one of the most pervasive threats to coldwater fish populations, and there remains considerable uncertainty as to how organisms will respond to changes in local environmental conditions. For brook trout (*Salvelinus fontinalis*), a species of coldwater fish with important socioeconomic and ecologic value, climate change is expected to reduce available habitat by as much as 80%. However, models predicting range shifts are conducted at large spatial scales and may fail to account for local habitat features that could enable population persistence. At smaller scales, the presence of thermal refugia from coldwater upwellings and tributary confluences can decrease ambient water temperature by up to 10°C. Areas of thermal refugia are often small and intermittently distributed throughout the environment, and success at locating and competing for access to refuge habitats is predicted to vary across individuals. In particular, individuals that are more aggressive and mobile are hypothesized to have a higher probability of establishing and defending territories in thermal refugia. However, this assumption has not been evaluated, and the higher metabolic needs of aggressive fish could reduce their competitive advantage at higher temperatures. In this study, we investigated how temperature modulated individual aggression, and how behavior influenced habitat use in a thermally diverse environment. We randomly assigned 20 brook trout to each of four artificial streams, and increased ambient stream temperature from 14°C to 23°C over seven days while maintaining one pool at 14°C to simulate groundwater upwelling. Fish were PIT tagged to monitor habitat use, with fixed antennas located near areas of thermal refuge and a fixed feeding station. Agonistic interactions were documented by scoring underwater videos filmed throughout the day. There was individual variation for the effect of temperature on aggression. While the majority of individuals became less aggressive at higher temperatures, some engaged in more agonistic interactions. Competitive dominance was only weakly correlated to size. These results suggest that individual fish respond differently to stream temperature rise, and that certain behavioral phenotypes may be more successful at finding and occupying thermal refuge.

Presenter: Ben Kline

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Genetic assessment of Brook Trout populations in the Laurel Hill region of Pennsylvania

Stephanie Dowell[1], Meredith Bartron[1], David G. Argent[2], and William G. Kimmel[2]

U.S. Fish and Wildlife Service Northeast Fishery Center[1] and California University of Pennsylvania[2]

As the only salmonid native to the Appalachian Mountains, Brook Trout (*Salvelinus fontinalis*) are an iconic species, popular sport fish, and economically important resource in the region. Anthropogenic disturbances including habitat fragmentation, agriculture, acidification, climate change, and the introduction of non-native species have led to the decline of Brook Trout populations throughout their native range. In Pennsylvania, state-wide efforts are underway to identify and protect streams supporting naturally reproducing Brook Trout populations. Incorporating genetic tools into the assessment of population status can help prioritize populations in need of management and provide information on the level of connectivity or isolation among existing populations. The objectives of this study were to characterize the genetic diversity within selected Brook Trout populations in headwater streams along the Laurel Hill in southwestern Pennsylvania and assess the level of gene flow among these populations. A total of 354 wild Brook Trout samples, collected across 10 streams, were analyzed using 12 microsatellite loci. Based on estimates of genetic diversity, effective population size, and relatedness, our results indicated that sample sites contained small populations of Brook Trout, sustained by low numbers of reproducing individuals. In some cases, these sites were isolated and inbreeding may be a concern to the long term maintenance of genetic diversity. The patterns of genetic differentiation revealed little to no contemporary gene flow across watersheds (HUC08 level) and among most sample locations. Overall, our results highlight the need for continued population monitoring and habitat remediation for Brook Trout populations in southwestern Pennsylvania.

Presenter: Stephanie Dowell

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Quantifying hatchery introgression in wild brook trout populations in a northcentral Pennsylvania watershed

Shannon L. White[a,b,] *, William L. Miller [a,b,], Stephanie A. Dowell[c],

Meredith L. Bartron[c], and Tyler Wagner[d]

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[b] Department of Ecosystem Science and Management, Pennsylvania State University

[c] U.S. Fish and Wildlife Service, Northeast Fishery Center and

[d] U.S. Geological Survey, Pennsylvania Cooperative Fish and Wildlife Research Unit, Pennsylvania State University

Due to increased anthropogenic pressures on many fish populations, stocking wild populations with hatchery individuals has become an increasingly common management practice. Recreational stocking can be controversial due, in large part, to the uncertainty about long-term genetic effects of interbreeding between hatchery and wild individuals (defined here as introgression). By disrupting locally adapted gene complexes and introducing maladaptive genotypes, genetic introgression can cause declines in wild population fitness and resiliency, and ultimately accelerate local population extirpation. Conversely, low survival and fitness of hatchery-reared individuals could minimize the genetic consequences of stocking hatchery fish into existing wild populations. We quantified the proportion of introgressed individuals in 30 populations of wild brook trout (*Salvelinus fontinalis*) distributed throughout the Loyalsock Creek watershed in Pennsylvania. Genetic assignment tests were used to determine the origin (wild vs. hatchery) for 1742 wild-caught and 300 hatchery-reared brook trout. These assignment tests generated the probability of an individual fish belonging to either a simulated wild or simulated hatchery population. Fish with intermediate probabilities of wild descent were classified as having introgressed origin, with assignment thresholds determined through simulation of first-generation crosses between wild and hatchery individuals. Even though 21 of the 30 streams we studied in Loyalsock Creek were directly stocked or within 2km of a stocking location, we found minimal evidence for genetic introgression in the populations studied. Over 93% of all wild-caught individuals assigned to wild origin, and only 5% of wild-caught fish showed evidence of recent introgression. While there was some variation in the degree of introgression across populations, average within-site wild probability was 97%. Our results suggest that hatchery introgression can occur at low rates, even in watersheds with on-going recreational stocking. However, results from this study should be viewed cautiously. Higher rates of introgression are common in other species of salmonids, and introgression could increase with changes in habitat. Further, we did not examine other potential mechanisms (*e.g.*, competition, declines in fitness, etc.) through which hatchery-reared fish may deleteriously effect wild populations.

Presenter: Shannon L. White

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Distribution and abundances of French Creek Mussels

Kyle Clark and Dr. Jay R. Stauffer, Jr.

The Pennsylvania State University

Unionid mussels play a vital role in a stream system as they act like natural filters, filtering mass amounts of heavy metals and other materials out of the water column daily. Because of this quality, they have recently been recognized for their use as indicators of water quality. French Creek, near Erie, Pennsylvania, is known for its unique and rich biodiversity and outstanding water quality. It is nationally renowned as one of the most important streams in eastern North America, and is identified as a globally significant watershed by the Nature Conservancy. French Creek is home to over 25 species of unionid mussels, four of which are federally endangered, and many are state endangered or threatened. French Creek has recently come under attack by a new invasive species *Neogobius melanostomus* (Round Goby), which naturally forages on *Dreissena polymorpha* (Zebra mussel) and *Dreissena bugensis* (Quagga mussel) in its native habitat in the Black and Caspian Seas. This study focuses on gathering population estimates and characterizing habitat variables of mussel species across 8 sites on French Creek. Snorkeling surveys accompanied by a mark recapture study were conducted during the summer of 2017 to collect the data. The data collected from this project will serve as a foundation for future population monitoring as French Creek experiences anthropogenic and natural stressors throughout time.

Presenter: Kyle Clark

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Comparison of aquatic fauna among major Pennsylvania drainages

Sara Mueller and Jay R. Stauffer Jr.

The Pennsylvania State University

Since the turn of the 20th century, aquatic macroinvertebrates have become ubiquitous and important indicators of water quality. This group of organisms is widespread in its diversity across a range of habitat types. Most studies concerning the distribution of aquatic macroinvertebrates are regional in scale or are based on a single taxonomic group. There is a distinct lack of inter-drainage comparison with aquatic macroinvertebrates as is common with fishes. In the summers of 2015 and 2016, nine Pennsylvania State Parks were surveyed for aquatic macroinvertebrates and fishes. Preliminary analyses show that macroinvertebrates do not follow fish patterns of biodiversity. This may be the result of the current state of taxonomic resolution, increased mobility of some aquatic macroinvertebrate taxa, or insufficient knowledge of the appropriate level of landscape analysis for aquatic macroinvertebrates.

Presenter: Sara Mueller

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Confirmation of species identifications of Sculpin (*Cottidae*) species in South-Central PA

Paul Christman, Theo Light, and Sherri Bergsten

Shippensburg University

Sculpins (family *Cottidae*) are small benthic fish commonly found in clear, fast-flowing, cold streams in the Northern Hemisphere. In the study area, there may be four or possibly five species. These species are the Slimy sculpin (*Cottus cognatus*), Blue Ridge sculpin (*Cottus caeroleomentum*), Potomac sculpin (*Cottus giardi*), Checkered sculpin (*Cottus* species cf. *cognatus*), and perhaps the Mottled sculpin (*Cottus bairdi*). Physical characteristics are commonly used to identify the species from each other. Unfortunately, these traits are hard to observe in live fish, and there are very subtle nuances between these sculpin species and their morphological characteristics; and that is why genetic identification has become an important tool in the identification of species. Caudal fin clippings were taken from 40 individuals collected from 11 streams in the Susquehanna and Potomac drainages in Cumberland and Franklin counties Pennsylvania. The samples were collected using a backpack electro fisher and fin clips were stored in ethanol at -80 C. The samples were thawed and massed to 15mg +/- 5mg, dried and cut into smaller pieces for digestion. Genomic DNA was extracted using the Quiagen DNeasy blood and tissue kit following the manufacturer's protocol for the purification of total DNA from animal tissue (spin column protocol). Mitochondrial genes for cytochrome B and ATPase 6 and 8 were amplified using primers L14724 and H15915 for cytochrome B and L8933 and H9795 for ATPase (Kinziger et. al. 2005). Both genes were amplified using polymerase chain reaction, Cytochrome B for 25 cycles at 94 C for 1 min, 48 C for 1 min, and 72 C for 2 min and ATPase for 30 cycles at 94 C for 50 sec, 55 C for 30 sec, and 72 C for 2 min. Gels were run to assess the results of the PCR products and were then purified using the Genejet PCR purification kit centrifuge protocols. Close relationships between sample sites and the standard published species were seen in *Cottus giardia*, *Cottus cognatus*, and the undescribed checkered sculpin. Relationships between the sites were seen but were separate from the comparison groups from the published literature. In the separated gene phylogram atpase showed a relationship between the separated samples in the combined gene phylogram and the *Cottus caeruleomentum*. This relationship did not carry over when the genes were combined. It was found that the use of these mitochondrial genes, although a useful tool to aide in the identification of sculpin these methods does not replace identification using physical characteristics.

Presenter: Paul Christman

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Use of environmental DNA to detect aquatic species from Susquehanna and St. Lawrence basins

Gregory R Moyer[1], Meredith Bartron[2], Daniel Gefell[2], Chris Reese[2], James Casey[3], and Rodman Getchell[3]

[1]Mansfield University, [2]U.S. Fish and Wildlife Service, and [3]Cornell University

Quantitative PCR assays were developed to target environmental DNA (eDNA) for *Pimephales notatus, Rhinichthys atratulus, Etheostoma olmstedi*, and *Lepomis gibbosus*. Assays were then used to screen 150 filtered water samples (75 triplicate water samples and 75 triplicate field blanks) for the presence of eDNA from the aforementioned taxa. Assays appeared sensitive but specificity may be compromised due to weak cross-species amplification of close congeners. Across the 150 samples, *L. gibbosus* had the greatest number of detections (n = 41) followed by *R. atratulus* (n = 33), and *P. notatus* (n = 30). The taxon with the least detections was *P. notatus* (n = 9). There was one instance of amplification of field blanks. Assays appeared to show general trends in abundance within and among sampling sites as predicted from qualitative abundance data observed in the field.

Presenter: Greg Moyer

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Environmental DNA detection of American Eels

Josh Grassi[1]*, Greg Moyer[l], Heather Galbraith[2], and Chris Rees[3]

[1]Mansfield University, [2]U.S. Geological Survey, and [3]U.S. Fish and Wildlife Service

Environmental DNA (eDNA) is an emerging technique for detecting aquatic organisms. Basically, a species' DNA can be detected from a water sample; therefore, it offers increased sensitivity over traditional detection methods, especially for nocturnal, bottom-dwelling organisms. One such organism is the American eel. In order to test the capability of this method a two phased project was invoked involving controlled setting samples and in the field samples. In a controlled setting, we tested the hypothesis that detection of American eel eDNA increases with eel density. Density was allowed to vary from 0, 1, 5, or 10 eels held in tanks and our experimental design was run in triplicate. From each tank, a 2-L water sample was collected, filter, and DNA extracted. DNA was amplified to determine presence/absence of eel DNA. After it was seen that presence/absence could be affectively detected in a controlled setting 50 field samples were collected, filtered, and DNA extracted to determine presence/absence of wild eel populations.

Presenter: Josh Grassi

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Expanding genetic resources to support species detection and biodiversity monitoring using environmental DNA

Julie C. Schroeter, Christopher B. Rees, Meredith Bartron, Aaron P. Maloy

U.S. Fish and Wildlife Service Northeast Fishery Center

Conservation of aquatic resources is often hampered by our limited knowledge of biological diversity and its distribution. Due to challenges with detection of rare, difficult to sample, or aquatic invasive species, and the expansion of genetic technologies, fisheries professionals are increasingly augmenting traditional fish biodiversity field studies with emerging eDNA techniques to identify species presence or absence. Using environmentally-collected DNA samples, the presence or absence of species can be assessed either for single species in a targeted approach, or assessed for multiple species through metabarcoding methods. In order to genetically identify species, both methods depend on reference sequences for marker design and testing. To facilitate marker design and testing for eDNA approaches, the USFWS Northeast Fishery Center has worked to develop a tissue archive and conduct genomic reference sequencing. The tissue archive provides DNA for qPCR marker testing and also serves as the source material for extensive mitochondrial DNA sequencing efforts to expand both the number of individuals and geographic representation of reference mitochondrial genomes. Using custom designed family-specific long-range PCR primer sets, we are working to expand the representation of complete mitochondrial genomes from freshwater fish, with specific emphasis in the Great Lakes region. To date, a total of 139 mitochondrial genomes representing 50 species from 9 different fish families have been successfully sequenced using Illumina MiSeq technology, all of which are being made publically available through GenBank. Sequencing efforts have recently addressed families such as Salmonidae and Cyprinidae, with species including Brook Trout, Lake Trout, Grass Carp, and Golden Shiner, along with many others found in Great Lakes drainages. Increased availability of mitochondrial genomes will help diversify potential applications of eDNA sampling.

Presenter: Julie Schroeter

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Potential negative outcomes from abandoned mine drainage remediation to an eastern brook trout (*Salvelinus fontinalis*) population: trade-off between isolation and invasion

Jennifer Graves[1]*, Thomas Clark[2], Brianna Hutchison[2], and David Janetski[1]

[1]Indiana University of Pennsylvania and

[2]Susquehanna River Basin Commission

Freshwater species have declined throughout their native ranges in part due to habitat fragmentation and invasive species. Information is often lacking, however, about how interactions between these stressors affect certain aspects of native populations. Brook trout (*Salvelinus fontinalis*) are a prime example of a species in decline due to human-related stressors, two of which are fragmentation from abandoned mine drainage (AMD) and competition with non-native brown trout (*Salmo trutta*). In an ongoing, multi-year study, we are assessing the abundance, behavior, and genetic structure of brook and brown trout in a western Pennsylvania watershed fragmented by AMD and scheduled for remediation in 2018. From past surveys, we predicted that AMD acts as a chemical barrier to brown trout invasion into a tributary dominated by brook trout. This watershed represents a common situation in Pennsylvania – brook trout populations are simultaneously fragmented, yet "protected" from brown trout invasion by AMD, but remediation could permit brown trout invasion upstream. To assess abundance, population estimates were calculated from nine ~150-meter stream reaches. To assess behavior, movement patterns of both brook and brown trout are being monitored into and out of stream reaches impacted by AMD using PIT (Passive Integrated Transponder) tags and 6 stationary PIT tag reader stations. Fin clips were taken from brook (n=235) and brown trout (n=188) in the watershed and degree of isolation will be estimated using gene flow and genetic diversity. Brook trout population estimates increase with distance upstream, then decline at a point, presumably due to proximity to the largest AMD discharges. Population estimates reveal brown trout are more abundant in the mainstem, but that invasion into the brook trout dominated tributary has already begun prior to scheduled remediation. Preliminary movement results show that the AMD is not acting as the complete chemical barrier as we predicted. Movement was detected between stations that bracket an AMD discharge and invasions were detected into the tributary with the highest AMD impacts. We predict that as water quality improves after remediation, brown trout invasion upstream will accelerate, increasing interspecific competition with resident brook trout. This trade-off between isolation and invasion presents a significant management challenge, and our study will highlight the need to be mindful of potentially negative outcomes stemming from AMD remediation efforts to the imperiled brook trout.

Presenter: Jennifer Graves

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Effects of small dam removal on fish assemblage in Manatawny Creek; a preliminary examination of a 17 year study

Allison M. Stoklosa[1], Richard J. Horwitz[1, 2], David H. Keller[1], and Paul F. Overbeck[1]

[1]Academy of Natural Sciences of Drexel University and [2]Drexel University

Dam removal has become recognized as an important component of stream restoration; however, few long-term studies have been conducted documenting ecosystem responses to removal. We monitored changes in the fish assemblage in Manatawny Creek, (Schuylkill River drainage, Pottstown, PA) before, during, and after a small (2 m high) dam was removed. The dam was removed in 2000 and monitoring has continued into 2017. A modified BACI (Before-After-Control-Impact) approach was used to determine differences in fish assemblages pre- and post-removal by monitoring a site downstream of the dam and a control site upstream and above the influence of the impoundment. Additionally, a site in the impoundment was monitored to determine if and when the assemblage in the former impoundment regained similarity to the control site. Two main types of sampling were conducted at each site: 5 x 5 m areal backpack electrofishing in riffles and reach level electrofishing. Comparisons between the control site and both the downstream site and impoundment will be made using regressions, t-tests, and ordinations. Preliminary examination of the data suggests a rapid infiltration of riffle species and decrease in pool species in the impoundment and a short-term decrease in some species downstream of the dam immediately following removal. Long term trends are still under analysis and will be presented at the meeting.

Presenter: Allison Stoklosa

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Groundwater as a source of emerging contaminants in the Chesapeake Bay

Tyler J Thompson, Tyler Wagner[12], Vicki Blazer[3], Adam Sperry[4], and Martin Briggs[5]

[1]The Pennsylvania State University, [2] Pennsylvania Cooperative Fish & Wildlife Research Unit, [3]Leetown Science Center, U.S. Geological Survey, [4]National Fish Health Research Laboratory, and [5]U.S. Geological Survey

Since 2005, high young-of-year natural mortality rates and declines in adult indices of abundance have been observed in some smallmouth bass populations in the Susquehanna River Basin. Endocrine disrupting compounds (EDCs) are hypothesized to be a contributing factor to the observed population dynamics. In order to better understand these compounds in the environment and their effects of fish populations, further research is needed to understand potential exposure pathways. In particular, there is a paucity of information on the role of groundwater as a source of EDCs for aquatic organisms. In fact, current research at river sites throughout the Chesapeake Bay Watershed, including in Pennsylvania – where surface water, stream sediment, and adult/young-of-year smallmouth bass are sampled for contaminants - led to the hypothesis that groundwater could be a potential exposure pathway for EDCs. Therefore, the objective of this research was to investigate the role of groundwater as a source of emerging contaminants in areas of known smallmouth bass spawning and rearing activity. Using thermal cameras to locate areas of groundwater upwelling, we sampled groundwater using drive-point piezometers at three locations, two located in the Susquehanna River Basin and one in West Virginia. Samples of ground and surface water were collected biweekly during smallmouth bass spawning season and monthly through September 2017. As an initial water chemistry screening tool, total estrogenicity was quantified through a bioluminescent yeast estrogen screen to use as an indicator of the presence of estrogenic EDCs. Preliminary analyses suggest that groundwater samples may be an important pathway of exposure, especially given the use of these areas for spawning by smallmouth bass.

Presenter: Thompson, Tyler

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Assessing the ecological recovery potential of a headwater stream after re-establishment of a conservation release

Matthew K. Shank

Susquehanna River Basin Commission

Stafford Meadow Brook is a 14-square mile watershed that flows into the Lackawanna River near Scranton, PA. This small watershed has three water supply impoundments yet still supports a naturally reproducing brook trout population. The importance of the natural flow regime in maintaining habitat to support ecological integrity recently became evident below the most downstream impoundment, which ceased making conservation releases for >2 years. Stream surveys determined that brook trout were thriving upstream, but were replaced downstream by habitat generalists in low abundance due to altered streamflows. The macroinvertebrate assemblage was likewise impaired downstream, although physical habitat was excellent throughout each reach. After the conservation release was restored, ecological and continuous instream monitoring were conducted in 2017 to assess natural recovery and habitat suitability for sensitive species such as brook trout both upstream and downstream of the impoundment. Results indicate that brook trout continue to thrive upstream and have recolonized downstream reaches, albeit in low abundance. Macroinvertebrate assemblages also show positive signs of recovery downstream. Continuous instream monitoring results indicate that although the conservation release has restored adequate streamflow to reaches downstream of the impoundment, the temperature regime may not be suitable for brook trout, which makes future natural recovery and/or restoration activities uncertain. Study methods and results will be discussed in the context of using innovative monitoring and analytical techniques to achieve ecological restoration through adaptive management after environmental harm occurs.

Presenter: Matt Shank

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Results from the 2017 Water Chestnut Chasers Challenge support early detection efforts in Pennsylvania

Amy L. Jewitt

Pennsylvania Natural Heritage Program

The purpose of the 2017 Water Chestnut Chasers Challenge was to: 1) Conduct a survey where the primary focus was to search for and report both positive and negative findings of water chestnut in Pennsylvania, and 2) If [new] waterbodies infested with water chestnut were found, make natural resource professionals near the affected sites aware of the need to conduct treatment efforts. All findings of water chestnut, whether they were positive or negative (i.e., absence data), were recorded in the Pennsylvania iMapInvasives database. This database serves as a central clearinghouse for spatial data storage of invasive species locations, survey, and management efforts. A combination of both natural resource professionals and citizen scientists participated in the Challenge, totaling 11 people. All data collected by participants were compiled in the Pennsylvania iMapInvasives database as either observation and/or survey data. Several waterbodies in Bucks County were discovered to have infestations of water chestnut not previously documented in the Pennsylvania iMapInvasives database. These new findings included at least one waterbody densely populated with water chestnut and in need of treatment efforts to restore native species and ecosystem functions. It is essential that an invasive species such as water chestnut is kept in check to preserve native species, allow essential ecosystem functions to occur, and to promote the use of lakes and rivers for recreational purposes. The findings from the 2017 Water Chestnut Chasers Challenge indicate that treatment efforts need to occur in several infested waterbodies in SE Pennsylvania. Management professionals also need to be aware of the seriousness of these infestations which cause harm to the environment and could spread to other non-infested waterbodies.

Presenter: Amy Jewitt

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A comparison of two methods to promote Pennsylvania catfish angling to urban anglers

Rick Lorson[1], Mike Depew[1], and Carl Richardson[2]

[1]Fisheries Management Area 8, Pennsylvania Fish and Boat Commission and

[2]Education Section, Pennsylvania Fish and Boat Commission

The impetus for increased attention to PA catfish came with the current Pennsylvania Fish and Boat Commission (PFBC) Agency Strategic Plan and the PFBC Strategic Plan for Catfish. A pilot program was initiated from this guidance in 2017 titled Summer Vacation Catfish incorporating already established Mentored Youth and Family Fishing components. One pilot each took place in the urban centers of Pittsburgh and Philadelphia with different guiding principles for each. The Pittsburgh pilot took place in a 2-acre pond in North Park, Allegheny county, with mentor and youth licenses required and stocked catfish. The Philadelphia pilot took place along the Schuylkill River in the Schuylkill River Trail Park at Walnut Street, with licensure waived and wild catfish only. Total participation and youth participation was 127 and 60 in Pittsburgh and 73 and 40 in Philadelphia, respectively. Half the anglers in Pittsburgh had not fished for catfish compared to one-fourth in Philadelphia. The mean program satisfaction rating (scale of 1 to 5) was identical for both programs at 4.83 and 100% of participants answered they would participate again. The Pittsburgh participants had a mean catfish catch per angler of 7.73 and an overall catfish catch rate mean of 0.91 fish/hr. In contrast, Philadelphia participants had a mean catfish catch per angler of 0.75 and an overall catfish catch rate mean of 0.23/hr. This pilot program was deemed successful at meeting objectives and will be continued in 2018.

Presenter: Rick Lorson

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Poster Abstracts

Presented by authors last name, alphabetically

*** INDICATES A STUDENT PRESENTER TO BE JUDGED**

POSTER: 1

Macroinvertebrate and fish communities in a stream exhibiting levels of specific conductance exceeding 4,000 µS/cm

David G. Argent and William G. Kimmel

California University of Pennsylvania

Surface and underground extraction of coal has degraded many landscapes throughout the Appalachian region of the United States. The deleterious effects on steam biota of untreated acidic drainages high in heavy metals from active and abandoned sites have been well documented. Mitigation strategies frequently include the addition of strong neutralizing agents in order to elevate pH and precipitate toxic metals. The resulting effluents exhibit high concentrations of sulfates, carbonates, and other ions which can markedly raise the specific conductance of receiving streams. However, the impacts of such inputs on stream ecosystems are not well-studied. This study documents one such case, Whiteley Creek, a Monongahela River tributary in southwestern Pennsylvania, which receives treated effluents producing in-stream conductivity values in excess of 4,000 µS/cm. We sampled fish and macroinvertebrate communities at ten sites from its headwaters to its Monongahela River confluence exhibiting conductivity values ranging from 2,400 - 5,400 µS/cm. Specific conductance showed no relationship to taxonomic richness of either community; however fish abundance declined with increasing conductivity, while macroinvertebrates increased. Extant communities dominated by tolerant taxa resulted in low macroinvertebrate and fish Indices of Biotic Integrity scores indicative of community stress. This study underscores the importance of biomonitoring and bioassessment of streams receiving effluents of chemically-treated acid mine drainages.

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POSTER 2:

Assessment of stream fish communities in the Allegheny National Forest

Daniel Brumbaugh, Heather Bechtold, Steve Seiler, Chuck Keeports,

Nathan Welker, and Adam Gilles

Lock Haven University and the US Forest Service

The objective of this multiyear project is to build an up to date list of fish communities in wadeable streams across the Allegheny National Forest. The streams sampled for this project were specifically chosen to address individual streams or watersheds where fish community data is lacking or considerably out of date, oftentimes with the most recent previous sampling event more than 20 years prior to our visit. We sampled stream fish communities from 85 sites between 2015 and 2017, by single pass electrofishing. We also collected basic water chemistry parameters and benthic macroinvertebrate samples. Our findings show that most locations contain robust populations of native fishes when water quality was good and there was an absence of culverts or other barriers. Future surveys are being planned to continue documenting the fish communities in watersheds where should be made current.

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POSTER: 3

Biological effectiveness of instream restoration on fish populations

David Huntzberry, Jeremy Gurtabow, Jonathan Niles, and Mike Bilger

Susquehanna University

Agriculture can negatively influence stream ecosystems through a variety of means including increased sedimentation, increased runoff of nutrients, and contamination of local groundwater. Loss of water quality can decrease in-stream habitat availability resulting in a shift in fish assemblages. In recent years, many farmers have become more receptive to adopting environmentally friendly agricultural practices. A variety of best management practices have been used by farmers, including restricting livestock access to the stream and enlarging riparian buffers. Efficacy of these management practices has not been studied thoroughly enough to determine ecological benefits to instream biota. In conjunction with the Conservation Districts in Montour, Northumberland, and Union counties, 11 local farmers and residents agreed to have 16 riparian habitat restoration projects constructed on streams that run through their property. To determine the biotic response to stream bank restoration, we conducted pre- and post-restoration sampling from 2015-2017. Stream assessments consisted of backpack electrofishing a 100-m site to determine the amount of fish species present, and collection of standard water chemistry data for comparative analysis. We found an increase in fish abundances and species richness at some sites post-restoration, likely due to decreases in sedimentation, increases in habitat availability, and less storm water runoff. Our results suggest that simple streambank restoration projects and best management practice plans could improve the health our not only local watersheds, but also to the Susquehanna River watershed and even the Chesapeake Bay.

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POSTER: 4

Effects of firing ranges on water quality in Marsh Creek, Howard, PA.

Cody Iannozzi and Heather Bechtold

Lock Haven University

The objective of this research was to evaluate how water quality parameters in a small stream may differ above and below a firing range. We evaluated water samples from Marsh Creek for contaminants such as nitrate, copper, sulfate, and phosphate. These contaminants have been shown to be compounds associated with gunpowder and projectiles and may be mobilized in soils. We also measured pH, temperature, and conductivity. Water samples were collected from Marsh Creek between Upper Pole Cat Rd. and the Bald Eagle Creek confluence on 9/29/17 and 11/10/17 under similar weather conditions. Data was analyzed by using t-test comparisons between sample location and each water quality parameter. We found marginally significant statistical difference in nitrate, copper, sulfate, pH, temperature, and conductivity between sample locations. These findings did not match the prediction that there would be a difference between upstream and downstream locations, indicating that there was no single source causing a significant change in water quality parameters within the sampled area. These findings are similar to a recent study on neighboring waterways indicating that Marsh Creek's water quality is not impaired, and is below the tolerable limitations set by PA regulations. This suggests the water quality found in Marsh Creek is fairly stable, despite a number of anthropogenic activities that occur within the watershed.

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POSTER: 5

Differing periphyton concentrations in the Alleghany National Forest

Deray Jones, Steven Seiler, and Heather Bechtold

Lock Haven University

The objective of this research was to determine the standing stock chl *a* (biomass) of benthic algae across a variety of forested locations and fish densities in the Alleghany National Forest. We evaluated aquatic algae using natural substrata with various size, texture, and origin located in upper, middle, and lower stream reaches. Using pigment analysis via spectrophotometry, we measured the algal chlorophyll *a* pigments from 33 sites. We also calculated rock area using planar analysis. Algae slurry samples were collected from sites from July 23rd, 2017 to August 10th, 2017. The slurry samples were collected onto filter paper by placing the filter paper on a vacuum manifold. Algal concentrations appear to vary with site parameters such as shading, fish abundances, and invertebrate identity

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POSTER: 6

Demonstration aquaponic system

Grant Karichner and Steve Seiler

Lock Haven University

Aquaponics is a system of aquaculture where waste produced by fish is used as a source of nutrition for plants. The purpose of this project was to create an aquaponics demonstration showing the sustainability of such a system. We used a 55-gallon fish tank, two grow beds, and expanded clay substrate to grow vegetables in a classroom. We are planning to scale this system up when we build a larger system within the Lock Haven University green house.

Presenter: Grant Karichner

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POSTER: 7

Preliminary survey for Lycoming County conservation district

Wolf Run restoration project

Samuel Lamport and Mel Zimmerman

Clean Water Institute, Lycoming College

The Lycoming County Conservational District is preparing to start restoration projects at 4 sites along Wolf Run (Lycoming County, PA). The restoration projects are needed because of agriculture impacts including limited or absent riparian buffers, limited conservation farming practices, and a high rate of bank erosion. In 2013, the DEP completed a TDML (Total Maximum Daily Load) for the Wolf Run Watershed. In this document, the DEP recommended putting in: stream bank stabilizations, riparian buffers, heavy use area protection, and manure storage. The project designed is going to stabilize 2,880 feet of stream bank and will prevent high amounts of nutrients and sediments from entering the Wolf Run Watershed. Clean Water Institute Interns were tasked with completing a survey prior to the start of the restoration projects. This survey included, water chemistry, coliform sampling, fisheries survey, and macroinvertebrate samples were taken. The fisheries survey was completed at the upstream site. Data collected indicates pH in a steady decline when going downstream, Alkalinity increases going downstream, and Orthophosphate and Phosphorous both decrease going downstream. The fisheries survey showed that there were 9 species of fish present. An Index of Biological Integrity showed that none of the sites are impaired biologically, however the sites are very close to being impaired. The Lycoming County Conservational District is planning to finish this project in the fall of 2018. Lycoming College CWI will continue to partner on this project.

Presenter: Samuel Lamport

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POSTER: 8

Diet analysis among black bass in the Monongahela River

Paige Lupyan*, Brandon Basinger*, and David Argent

California University of Pennsylvania

Fish change their diets in relation to prey availability and season. Here, we document the diets of Black Bass (Largemouth, Smallmouth, and Spotted) during fall (October and November) in the Monongahela River, a largely understudied system. Fish were collected using boat electrofishing equipment and immediately frozen. Fish were measured to the nearest mm (total length), aged using scales, and their diets determined by removing their stomachs. Forage were identified and tallied as percent occurrence. The study yielded interesting results, showing that the forage preference was Crayfish (likely *Cambarus*) and Dragonfly larvae. Forage size nor amount of stomach contents correlated to size or age of fish. We can conclude that Bass diets in the fall are adapted to target slower moving prey, as well as forage that are generally found near the bottom of the water column. This feeding trend allows for more sluggish behavior, while still providing a consistent food source.

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POSTER: 9

Occurrence of intersex in fishes from the Delaware and Susquehanna River basins: a temporal and interspecific comparison

Raffaela Marano and Richard J. Horwitz

The Academy of Natural Sciences of Drexel University

Endocrine disruption is an issue of emerging concern in aquatic systems. Endocrine disruption has been documented to result in decreased reproductive success, skewed sex ratios, increased vitellogenin levels, intersex, disease, and death in a variety of freshwater fish species. In this study, intersex, or the presence of testicular oocytes in gonochoristic fish species, was utilized as an indicator of endocrine disruption. The study design is based on both a temporal and interspecific comparison of intersex occurrence through the use of paired historical and modern fish samples. The historical samples were obtained from the ichthyology collection at the Academy of Natural Sciences of Drexel University and replicate samples were collected in July and August of 2016. Historical samples from the Delaware sites include the oldest available specimens (from as early as 1898). The Susquehanna specimens spanned a longer time gradient with multiple samples (n=4) ranging from 1969 to 2016. Male *Cyprinella analostana* and *C. spiloptera* were collected from three sites in the Delaware and one site in the Susquehanna River basins. Twenty male specimens from each sample were analyzed histologically to document the prevalence and severity of intersex. Additionally, several smallmouth bass, Micropterus dolomieu were collected and assessed as a known sensitive species. Four potentially sensitive species were identified and assessed in 2017. These four species were *Lepomis auritus, Ambloplites rupestris, Etheostoma zonale, and Notropis hudsonius*, and represented additional modern specimens. These species were added in an attempt to gain a better understanding of how endocrine disruption impacts the entire fish community. No specimens analyzed in this study displayed intersex other than eight *M. dolomieu* collected from the Susquehanna River. Land cover data was used to calculate land cover percentages for each basin. Land cover percentages indicated that the greatest altered land cover type in the Susquehanna River basin was agriculture whereas developed land was the greatest altered land cover type for the three Delaware River basin sites. This study was a first attempt at using historical specimens to understand endocrine disruption prior to the emergence of the field in the late 20th century. Additionally, there is interest in identifying a small-bodied indicator species of endocrine disruption. *Although C. analostana, C. spiloptera, L. auritus, A. rupestris, E. zonale,* and *N. hudsonius* did not portray intersex, future efforts should focus on assessing other common, small-bodied species within the Delaware and Susquehanna River basins to identify a small-bodied indicator species that can be used to assess the impact of EDCs across an entire watershed.

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POSTER: 10

Diet of young-of-the-year smallmouth bass in the upper Juniata River system

Katie Mattas*, Logan R. Stenger, Ryan E. Heisler, Francesca M. Ferguson,

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Juniata College

The decline of young-of-the-year (YOY) smallmouth bass (SMB, *Micropterus dolomieu*) recruitment and adult densities in the Susquehanna River basin since 2005 raises concern for the health and wellbeing of the fishery. Our study focused on understanding the feeding ecology of YOY SMB in the upper Juniata River watershed, a major tributary to the Susquehanna River. We studied the mainstem of the upper Juniata River, and the major tributaries forming and joining the river. We sampled the YOY smallmouth bass for a two-year period during the summer of 2016 and 2017. Our specific objectives were to 1) characterize the diet of SMB and a potential invasive competitor, the rusty crayfish (*Orconectes rusticus*), 2) document the physical condition and external health of individuals, and 3) evaluate the effectiveness of gastric lavage to extract diet contents at an early life history stage. A subset of individuals was sacrificed to check lavage efficiency and these individuals were also sent to be examined for histopathological anomalies that may result from pharmaceutical contamination (i.e., endocrine disrupting compounds) that is considered to be a likely cause of SMB decline. We also quantified habitat conditions using rapid visual techniques and ecological health of each site following the protocols for the Pennsylvania Index of Biotic Integrity for wadeable freestone streams. PA IBI scores (range 34 – 67) and habitat conditions (range 46 – 70%) were rather poor in both years. In summer (July and August) 2016, YOY SMB were numerous and were in excellent health, but were nearly absence during the same time in 2017. Few external anomalies consisted of parasites only. Most individuals were full of prey items, which on average consisted of about half aquatic prey and half terrestrial or neustonic prey. Rusty crayfish diet contents lacked any resemblance to diet contents in YOY SMB. Gastric lavage techniques were effective at removing gut contents and only a few individuals were found to have stomach contents remaining when dissected in the lab. Furthermore, nearly all YOY SMB fully recovered from field lavage experiences. Only 2 individuals died, and this was likely due to extreme river surface water temperatures (89 F) at the time of sampling. Thus, gastric lavage is a safe and effective technique to study YOY SMB feeding ecology and important links between recruitment, diet, and food quality without having to kill numerous fish.

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POSTER: 11

Microbial Ichthyology

Whitney Peters, Erica Fanning, Joseph Calabrese, and Coja Yamashita

Lock Haven University and the PA Fish and Boat Commission

The overall objective of this collaborative research project with the Pathology Laboratory of the PA Fish and Boat Commission (PAFBC) is to conduct base-line preliminary screening of gut microflora in feces from salmonid fish including Oncorhynchus mykiss (Rainbow trout). This is a novel project not yet undertaken by the PAFBC in order to establish the "health" of fish prior to standard protocol to add antibiotics and also probiotics to hatchery runways. Prior to treatment with antibiotics and probiotics, we sampled 10 fish and cultured 23 isolates from the gut lining and feces combined. Of these 23 isolates, we found 4 gram positive and 5 gram negative isolates from the gut lining. In addition, we found 6 gram positive and 8 gram negative isolates from the feces. The presumptive genera of these isolates are as follows: 2 Bacillus spp. in the fecal, 1 Salmonella spp. in the fecal, 1 Pseudomonas spp. in the gut, 3 Brochothrix spp. in the fecal, 1 Pasteurella spp. in the fecal, 4 Aeromonas spp. in the fecal, 2 Bacillus spp. in the gut, 2 Pseudomonas spp. in the fecal, 2 Aeromonas spp. in the gut, 2 Brochothrix spp. in the gut, and 2 Pasteurella spp. in the gut. Further research will be conducted to identify rainbow trout GI tract bacteria after treatment with antibiotics or probiotics.

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POSTER: 12

Who will be the apex predator when climate change effects local streams?

Savannah T. Rhoads*, Shannon White, and Jonathan Niles

Susquehanna University and The Pennsylvania Cooperative

Fish and Wildlife Research Unit

Air temperatures are expected to rise approximately 4º C over the next 50 years as a result of global climate change. As temperatures rise, the range of habitats will shift along the latitudinal gradients, potentially causing local species decline. This is especially true for less mobile species that are limited in their ability to disperse and colonize new habitats, for example specific fish species. Studying the response of aquatic populations to stream temperature rise will enable more accurate predictions of abundance, which will lead to more appropriate conservation efforts. Warmer temperatures will increasingly favor species with a higher thermal tolerance, including many nonnative species. As these species colonize new habitats, they are predicted to increase in population size and distribution, which could impact native species. Brook Trout (*Salvelinus fontinalis*) populations are native to headwater streams in the Appalachians of North America. This species is of high conservation need, with threats including stream temperature rise and competition with nonnative species, particularly Brown trout (*Salmo trutta*). Because Brown Trout have a have a higher thermal tolerance than Brook Trout, future competition is expected to decrease Brook Trout population sizes. Using an experimental stream system and video we evaluated the effects of Brown Trout on Brook Trout behavior and habitat use in experimental streams across three temperatures at the upper, lower, and intermediate thresholds for brook trout. In addition, we also measured short-term growth rate at these three different temperature thresholds over the course of several weeks. We hypothesize that competitive advantage and preferential habitat positions will shift from brook trout to brown trout with increasing temperatures. We also hypothesize that there will be decreased brook trout growth in the presence of brown trout as temperatures increase. Brook trout are a recreationally and culturally important species, which indicate high water quality, and it is important to preserve this native trout to maintain biodiversity.

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POSTER: 13

Determination of diet overlap between newly introduced round gobies and native benthic fishes in the French Creek watershed

Ivy Ryan and Casey Bradshaw

Allegheny College

Round Gobies (*Neogobius melanostomus*) are an invasive fish species from the Eurasian Black and Caspian Seas and were first discovered in the Great Lakes in 1990. Since then, they have been found outside of the Lake Erie Watershed into the upper Allegheny River watershed, specifically LeBouef Creek located in Erie and Crawford Counties of northwestern PA. The impact of Round Gobies in the French Creek watershed, which holds the some of the greatest diversity of fishes and freshwater mussels in the Eastern United States, is poorly understood, but predicted to have negative effects on native fauna. Fishes were collected with seines and macroinvertebrates were collected with D-frame kicknets at nine locations throughout the French Creek Watershed during the summer of 2016 and 2017. Fishes were collected, preserved and dissected to remove stomach contents which were identified to lowest possible taxa. Preliminary results indicate that Round Gobies are consuming similar prey items to native benthic fishes, specifically darters. Additionally, the stomach contents of Round Gobies collected in French Creek have had a high proportion of native freshwater mussel shells. More research is being conducted to determine if the presence of Round Gobies in LeBeouf Creek and the mainstem of French Creek are disrupting the lower levels of the trophic system by displacing and outcompeting small benthic fishes for food such as aquatic macroinvertebrates and preying on native juvenile mussels.

Presenter: Ivy Ryan

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POSTER: 14

Grain size characteristics of stream channel sediments where stream restoration projects are underway.

Linsey Sipple* and Dan Ressler

Susquehanna University

Streams and rivers with compromised riparian zones, especially along agricultural landscapes, are particularly susceptible to an increased buildup of stream bottom sediment. An abundance of fine sediment within a stream system can congest the water, potentially smothering aquatic insects and oxygen producing plants, creating an inhospitable environment for sensitive fish species, such as trout. Utilizing GIS technology, the Chesapeake Conservancy has developed a stream restoration prioritization tool to identify appropriate sites in central PA for future riparian buffer restoration projects. For this research, multiple sediment samples were obtained from the sites chosen by the Chesapeake Conservancy as well as from previously restored stream sites and unimpaired forested stream sites. The mean grain sizes and sorting ranges were calculated for all samples obtained and can be used to build a reference profile of the grain size characteristics of healthy, restored, and agriculturally impaired streams. The grain size statistics calculated from some pre-restoration samples can also be compared with samples collected after the restorations in the hopes of better determining the potential benefits of stream restorations in regards to sediment quality. The grain size characteristic determinations for the sampled sites can be used in conjunction with previously collected fish population data to document the relationship present between sediment quality and fish species abundance at impaired versus unimpaired stream sites. Using this comparison, we can better predict how stream restoration projects may benefit stream systems in regards to both sediment quality and fish populations.

Presenter: Linsey Sipple

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POSTER: 15

Variability in endocrine-disrupting compounds in the upper Juniata River system

Logan R. Stenger*, Ryan E. Heisler, Katie Mattas, Francesca M. Ferguson, Grace Noll
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Population declines and disease incidence in smallmouth bass (*Micropterus dolomieu*) in the Susquehanna River basin have been linked to endocrine-disrupting compounds (EDCs) as a likely causative agent. Nothing is known about EDC dynamics in the upper Juniata River basin, and specifically how EDC patterns may vary with hydrologic conditions and landscape characteristics. We sampled water in the main stem of the Juniata River and at 5 major tributaries across a range of discharges (e.g., peak storm flows, descending flows, base flows, etc.) and landscape characteristics over a 2-year time frame during the summers of 2016 and 2017. Samples were analyzed for EDCs measured as total estradiol equivalents (EEQ, ng/L). We also collected information on pH, dissolved oxygen, temperature, specific conductance, and total dissolved solids during each sampling event to identify possible connections between hydrologic conditions and variation in EDC concentrations. We found extremely high spatial and temporal variation in EDCs concentrations. Concentrations varied highly within sites at the same time, within sites at different times, among sites, and between years, but levels thus far have not surpassed the 1 ng/L threshold considered to be a concern for fish health. Thus far, we could not detect a trend in EDC concentrations along a continuum of the Juniata River downstream of the waste water treatment plant. Additionally, our current analyses cannot link variation in EDC concentrations to discharge, simple water quality measurements, or landuse/landcover at 2 spatial scales, but early indications suggest that EDCs are present in quantities that should be considered important for addressing ecological health in the broader Susquehanna River basin.

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For graciously hosting the 2018 meeting, the PA Chapter would like to thank…

Dr. Mel Zimmerman, Dr. Robert Smith

and

The Clean Water Institute

Lycoming College

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*The PA Executive Committee's 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.*

NOTES: