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Pennsylvania Chapter American Fisheries Society

FALL 2020 NEWSLETTER

2020 - 2021 Chapter Officers

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President Elect - Adam Slowik

Past President - Greg Moyer

AMERICAN FISHERIES SOCIETY

PENNSYLVANIA CHAPTER

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Executive Committee - Matt Shank

Secretary / Treasurer - Sara Mueller

Executive Committee - Tyler Grabowski

Contents

Background Photo Credit: A. Leakey

Message From The President

George Merovich,
Juniata College

Greetings everyone. Welcome to the fall 2020 edition of the PA Chapter of the American Fisheries Society newsletter. I am looking forward to leading the chapter this year. I officially took over as president at our summer 'social' in July, which turned out to be a virtual meeting over zoom. Unfortunately, due to current circumstances surrounding COVID19, we had to cancel our planed gathering at the Raystown Field Station on Raystown Lake. We will revisit this opportunity again in summer 2021; it promises to be a good opportunity, so I invite you to watch for information on social media and at our next state conference early next year.

I want to thank Greg Moyer, past PA AFS president, for his service over the last year and pulling together our Spring conference in February just before COVID hit. A summary of the conference appears within this newsletter. Likewise, I want to recognize 2 new additions to our Executive Committee. Tyler Grabowski, a fisheries biologist for the PA Fish and Boat Commission stationed in Area 6, southeastern PA, will serve as ExCom member 2, as Adam Slowik moves to president-elect. Emily Bierer joins us as student rep. She is a new PhD student at Duquesne University this fall. We look forward to your service to the mission of AFS and keeping our chapter active and growing.

On that note, I would like to summarize for everyone and provide some guidance for new folks and new students, who may be just joining us, what AFS is all about, our mission. Obviously, we are a group of folks with deep-seated interests in fish, fisheries, aquatic ecosystems, and the services they provide humans. AFS promotes research and education that seeks to ultimately advance conservation of fisheries resources for all humanity. At the national level, AFS is the oldest professional society (150 years!!) in the world with these goals in mind. Aquatic ecosystems and the services they provide are arguably by far the most threated resources on earth. At no time in our history have freshwaters been under the stress that they are today. Therefore, there is no better time than the present to be involved in aquatic resource science, to accelerate efforts in conservation and education. It is a challenging and exciting profession, but we need more effort and more involvement. And we need that badly at all levels to protect, conserve, and restore the services these aquatic ecosystems provide us.

Thus, as president of the PA Chapter I would like to make an important goal to increase membership, in particular student participation and membership, in the state chapter. Please encourage students of any level to become a member. PA membership for students is only $5, but perhaps more importantly are the networking opportunities and the chance to get involved in leadership activities…awesome resume builders! I would eventually like to see this manifested in more college student sub-units of AFS as well. This will be challenging given so many things competing for our time, but the California University of PA unit needs some companionship! I encourage innovative thinking to make this happen. Likewise, for folks who are already members, I want to encourage you to become members at the national level. For students, this is only $20 and membership comes with numerous benefits, especially access to all the AFS journals and discounts at the AFS online bookstore (a huge benefit if you are a college student). Membership at BOTH the state and national level is important. Did you know that PA AFS has one of the lowest rates of national membership? We must increase this.

Over the next year, we will be preparing our Chapter's contribution to the national AFS 150th anniversary celebration. This project was slated for display at the national meeting in Columbus this past August, but now is scheduled for Baltimore in 2021. (Yes, that makes AFS founding in 1870 by the way!). Again, I thank Greg Moyer for working on this and I want point out that PA has a deep and rich history in fisheries research and conservation as well, given the resource exploitation woes of the past. This should be an exciting exhibit to partake. If you would like to be involved in this project, please let us know. We welcome your input.

Lastly, for now, look forward to the developments of our future spring meetings. In 2021, we are tentatively in discussion about a joint meeting with Northeast Association of Fish and Wildlife Agencies (NEAWFA) and in 2022 a joint meeting with PA Trout Unlimited.

Thanks to all the Excomm members for their leadership in our great AFS chapter. To everyone, please get out there and do good science, research, conservation and education for the sake of fisheries and all of us who depend on these resources. Learn something new everyday and seek to pass that wonderful world on to new students who will be the trustees of our fisheries resources for future generations in our Commonwealth of Pennsylvania.

Recap of 2020 Spring Technical Meeting

The PA Chapter held its spring technical meeting at Juniata College on Feb 6 and 7, 2020. A total of 80 attendees mingled and listened to a range of talks under the conference theme of Aquatic Resource Restoration. Dr. Jay Stauffer's plenary talk reviewed aquatic research restoration case studies of his research on schistosomiasis in Malawi and the Chesapeake log perch in the Susquehanna River. Perhaps one of the most captivating talks was by Mary Kemp, who is featured in the Member Spotlight section below. Mary presented some fascinating underwater video footage of minnow behavior on nests. Danielle Massie's presentation on how lake-specific characteristics mediate the temporal relationship between walleye growth and warming water temperatures earned her the 2020 Cooper Award. Stephanie Letourneau, an undergraduate environmental science major at Juniata College won the best student oral presentation for her talk on ESRI Story Maps as a tool for digital learning about a marsh restoration experiment in the Chesapeake Bay. Amy King from Mansfield University won the best student poster presentation for research on Japanese knotweed decomposition by macroinvertebrates and microbes. A total of 4 different workshops were held on the second day of the conference. They included presentations on eDNA, beginning statistics with R, mayfly identification, and minnow identification.

(L-R): Matt Shank (ExComm member); Adam Slowik (ExComm member); Sara J. Mueller (Secretary/Treasurer); Gregory Moyer (President), George Merovich (President-Elect); Doug Austen (AFS, Executive Director); Patrick Shirey (Northeast Division AFS Vice President)

A packed house at Juniata College for the Plenary Talk

Dr. Jay Stauffer Jr.'s Plenary Talk on Chesapeake log perch reintroduction

Stephanie Letourneau with her best student oral presentation on ESRI Story Maps as a tool for digital learning

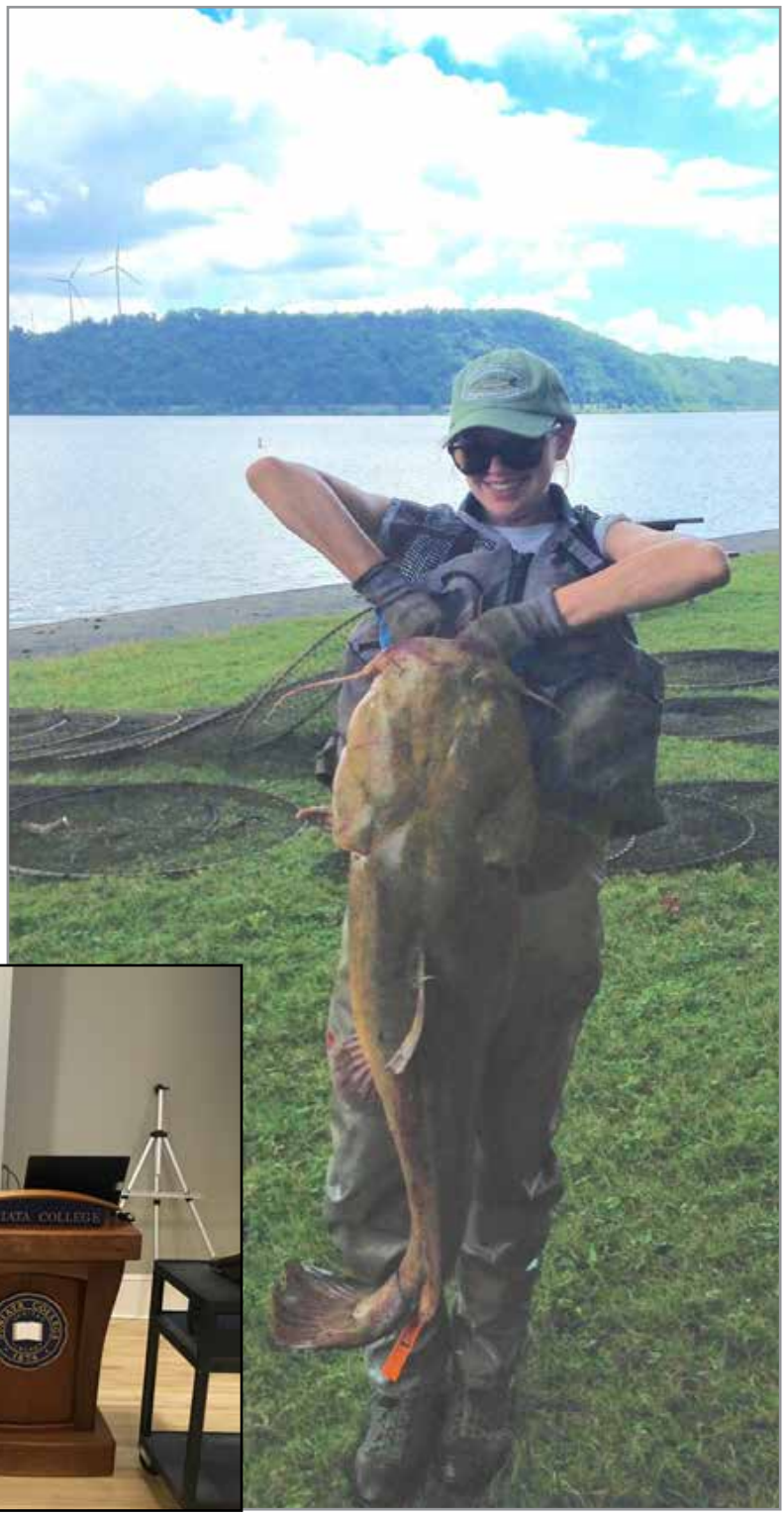
Amy King accepts her best student poster presentation award

2020 Cooper Award

Danielle Massie was chosen as the 2020 Cooper Award Winner. Danielle provided a short update about her activities since winning the award below.

"I recently graduated from Pennsylvania State University in March 2020 with a Masters of Science in Fisheries and Wildlife Science. My thesis research focused on understanding how macroscale changes in water temperatures may impact the growth of fishes. Both chapters of my thesis work are under review with the Canadian Journal of Fisheries and Aquatic Sciences. Currently, I'm working as a 8th grade science teacher in Hartsville, SC."

Congratulations, Danielle! Thanks for all your contributions to PA AFS, and best of luck in the future.



(L-R): Past President Greg Moyer and Cooper Award Winner Danielle Massie at the 2020 PA AFS Spring Technical Meeting

Research and Project Updates

Snake basking on woody material in a stream: wildlife utilizing a fish habitat improvement structure.

The Bigger Picture: Interconnections Between Forestry, Wildlife, and Fisheries

by Nate Reagle, Ecologist
PA DCNR, Bureau of Forestry

Introduction

It is common to observe specialists within natural resources. There are wildlife biologists, foresters, fisheries biologists, and more. This is also often reflected in academic majors. While this specialization can lead to efficiency and experts in a particular field, it is my goal to highlight the interesting interconnections between these disciplines.

Ecology is the study of the relationships between organisms and their physical surroundings. When one thinks ecologically, it becomes clear that everything is related. All it takes is an awareness of these interconnections to realize that managing for one resource has implications for other resources. By thinking about these relationships, it is possible to not only minimize conflict between resources, but even increase the benefits of resource management across disciplines. John Muir wisely stated, "When we try to pick out anything by itself, we find it hitched to everything else in the universe."

Forest and Fish/Stream Interactions

I'll start with interactions between forests, fish and streams. Forests have direct impacts on the hydrology of a watershed. Forested watersheds typically yield cleaner water and have high infiltration rates resulting in low surface runoff. The trees along streams increase streambank stability and provide habitat diversity such as scour pools, backwater pools, and overhead cover when they fall into the stream. The health and functionality of headwater streams are dependent on the surrounding vegetation for leaf litter on which the aquatic insects feed along with terrestrial insects that fall into the stream. In addition to the leaf litter input to the stream, dissolved organic carbon leaches from surrounding forests into the streams and feeds the base of the food chain: the bacteria.

-- Nate is an ecologist with the Pennsylvania Bureau of Forestry. He focuses on stream restoration, riparian wetlands, floodplains, forest interior wildlife, ecosystem restoration and pollinator habitat. Nate is also a corporate faculty member at Harrisburg University teaching stream ecology and ecosystem restoration. --

Forest and Wildlife Interactions

Simply put, forests provide habitat for wildlife. This includes food, shelter, water, and space. Forest wildlife feed on vegetation such as twigs, buds, leaves, inner bark, and fruit of forest vegetation. Forest wildlife also depends on forest vegetation for shelter such as conifer cover and dens. It isn't difficult to realize the dependence of wildlife on forests. I will therefore focus on the forest dependence on wildlife, which includes insects for this discussion.

Some forest trees and shrubs are insect pollinated. These trees and shrubs require insects in order to successfully reproduce and ensure the future of these trees and shrubs. Pollination is just one part of the reproductive cycle; some trees and shrubs also rely on animals to disperse the seeds. Think of squirrels and blue jays burying acorns then failing to retrieve them. Songbirds and bear are common dispersers of seeds after they have eaten fruit and berries then travel away from the source of food. Savvy foresters are well aware of the importance of some wildlife to the success of forest management. The next example of forest dependence on animals is not as popular, yet ecologically important. Insect defoliations are a natural disturbance agent for forested systems. While small scale defoliation events can make small changes to the forest dynamics, larger scale defoliations can alter vegetation dynamics and even cause a new forest to establish resulting in young forest. Disturbance is required for diversity within the ecosystem, as demonstrated by the benefits of timber sales.

Another interaction that is often a source of frustration is the herbivory by larger mammals. Deer can often have significant impacts on forest regeneration, species composition, and the resulting habitat. Non-native insect pests such as gypsy moth, hemlock woolly adelgid, and emerald ash borer can also lead to very negative impacts to the forest ecosystem.

Wildlife and Fish Interactions

The interconnections between wildlife and fish are a bit more straight forward for the most part and deal with the food web. Terrestrial wildlife can be predators on aquatic organisms. Birds such as belted kingfishers eat fish, birds and bats eat adult aquatic insects, and mammals such as river otters and raccoons rely heavily on aquatic food sources. While not as obvious, the predation can also be from aquatic organisms on wildlife and terrestrial food sources. Fish often eat terrestrial insects when they fall into streams, especially in the summer when aquatic insects are sparse. In larger bodies of water, some fish can even eat ducklings. Another example of wildlife and fish interactions includes wildlife providing aquatic habitat diversity. This will be covered in the next section discussing wildlife, fish, and forest interactions.

Wildlife, Fish, and Forest Interactions

This is where it really gets interesting. I've mentioned about the value of trees falling into the streams in relation to fish habitat. These fallen trees in the stream corridor also provide nesting habitat for the Louisiana waterthrush and winter wren. The in-stream habitat also benefits wood turtles in addition to the fish community. The woody material also collects leaf litter on which aquatic insects feed. The more aquatic insects present, the more fish food and Louisiana waterthrush food there is. The woody material in the stream corridor can also result in stream-side wetlands, providing habitat to a variety of wildlife and benefitting water quality in the stream.

Finally, the most controversial interaction: beaver activity. Beavers can drastically alter the habitat in which they reside. This includes shifts in woody vegetation, creation of wetland habitat, alteration of stream hydrology, and creation of habitat diversity within the stream. Many species of wildlife benefit from beaver dams including muskrat, ducks, songbirds, turtles, and frogs. The wetland habitat can be surprisingly rich in pollinator plants. Beaver dam complexes can result in higher base-flow for streams, resulting in a more regular flow regime, a crucial aspect for supporting aquatic life. When beaver dams are abandoned and the dams fail, the resulting meadow can provide excellent early successional habitat for wildlife such as woodcock. It is clear in this example that one species of wildlife can have large impacts on forests, other wildlife, and aquatic life.

Summary

Hopefully the importance of these interactions is now evident. It can be fun, challenging, and rewarding to consider all these interactions while managing resources. While specialization can be valuable, looking at the big picture and thinking holistically can be valuable as well. The more awareness there is pertaining to these interactions, the better we can manage resources to minimize conflict and maximize benefit.

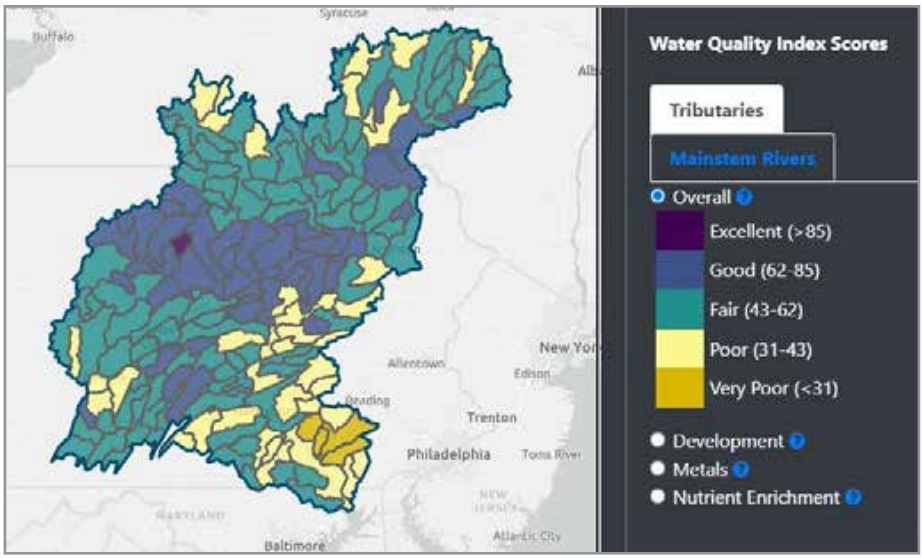
Left: Bumble bees in a nest box: these bees are in a forest setting and are important pollinators for trees, shrubs, and wildflowers.

Right: New wetland created by doing a stream restoration project. The wetland now benefits frogs, salamanders, and birds.

New Water Quality Assessment Tool Introduced by Susquehanna River Basin Commission

by Luanne Steffy, Aquatic Ecologist, Susquehanna River Basin Commission

Joanna Berry, West Virginia Department of Environmental Protection

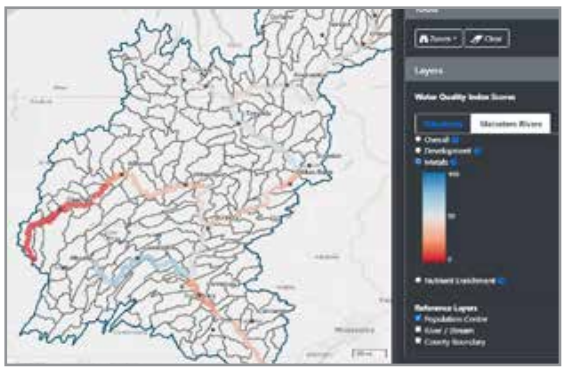


Water quality is complex, and the multitude of factors influencing water quality make it challenging to define. How can scientists best translate technical water quality data into something stakeholders and the public can readily understand and use? How do scientists know the importance of water quality concentrations across rivers and streams if they are meeting basic water quality standards? How can scientists show improvement in water quality across time? SRBC staff scientists recently developed a Water Quality Index (WQI) for the Susquehanna River Basin to help answer these and other challenging questions. The Susquehanna WQI was completed in 2019 with three main objectives: 1) assess water quality at a stream site over time and allow for comparisons between sites within the river basin during baseflow conditions, 2) allow water quality information to be easily understood and used by decision makers and the public, and 3) serve as the basis for linking chemical stressors (water quality parameters) to potential biological responses.

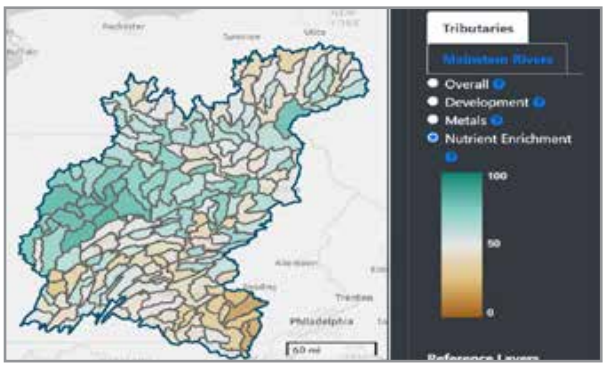
The Susquehanna WQI was developed using monitoring data collected throughout the river basin by Commission staff during the ten-year period 2008-2017. The final dataset includes more than 8,000 records from nearly 1,400 unique stream sites. The Susquehanna WQI converts raw concentrations of nine commonly monitored parameters into an index number between 0 and 100 — the greater the number, the better the water quality. The nine parameters are grouped into three category scores: metals (aluminum, iron, and manganese), nutrient enrichment (nitrate, total phosphorus, and total organic carbon); and development (chloride, sodium, and sulfate).

The user-friendliness of the tool and an intuitive 0-100 scoring scale are two of its greatest strengths, along with the ability to easily track changes in water quality across spatial and temporal scales. In addition to the overall WQI score, each category score can be used individually as a mechanism to compare specific water quality issues in certain geographical regions of the Susquehanna River Basin. The WQI also includes a feature that allows for comparison between only streams of the same size as well similarly sized streams in a specific ecoregion.

One of the first large-scale applications of the Susquehanna WQI was to calculate WQI scores for all sites with sufficient data from 2000-2018 and average these scores for each Hydrologic Unit Code (HUC) 10 watershed in the basin. An interactive map was created to allow users to view color-coded water quality ranks (excellent, good, fair, etc.) at the broad scale level as well as zoom in to individual streams and sites. The clarity and simplicity of its output coupled with its ease of use make this tool applicable for the technical scientific user as well as water resource managers, policymakers, and non-scientists alike.



Mainstem River Metals Scores

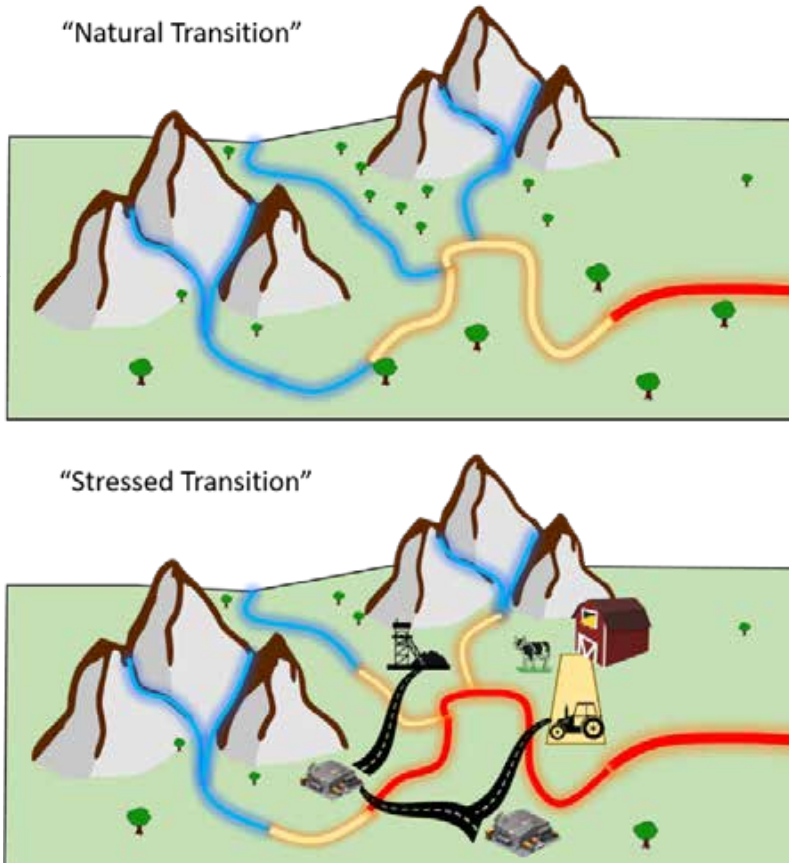


Tributary (HUC10) Nutrient Enrichment Scores

Thermal Fish Index: A Tool for Assessing Stream Health in Pennsylvania

By: Tim Wertz and Matthew Shank, Pennsylvania Department of Environmental Protection

Figure 1. Theoretical example of natural longitudinal transition areas versus stress induced fish assemblage transitions. With applied stress to a cold water assemblage (blue), the CWA reduces, the transitional assemblage (yellow) is shifted upstream and the warm water assemblage (red) is expanded.



Using biotic communities to assess stream health has been a proven method over the past few decades. The Pennsylvania Department of Environmental Protection (DEP) has continued to develop and produce these methods to determine waterbody condition so that management strategies can be initiated to protect our valuable aquatic resources. Historically, biotic assessments in Pennsylvania have been centered around macroinvertebrate communities and collection/assessment methods have been developed for use in a variety of habitats including: Freestone streams, Low-gradient streams, Limestone streams and Semi-wadeable rivers. While macroinvertebrate-based bioassessments have proven invaluable, there has oftentimes been a need to compliment these methods using additional biotic communities (e.g., fish, periphyton). Benefits of a fish-based bioassessment include: 1) Relatability, meaning most people are very familiar with fish and their importance as either a food source and/or recreational/economic potential and 2) Fish generally live longer than macroinvertebrates which require water quality and habitat to remain suitable throughout not only the life-span but also throughout vulnerable life-stages (e.g., egg to adult).

Over the past few decades DEP has pursued the development of fish-based bioassessments but these efforts had proven to be extremely challenging based on the distribution of species along a longitudinal gradient (headwaters to large rivers) and across basins. In 2016, DEP began developing a tool to circumvent many of these challenges by using a trait-based approach that relied on tolerance (or preference) values instead of taxonomy to overcome distributional challenges. Specifically, DEP pursued thermal preference of species in an effort to standardize species across both longitudinal and inter-basin distributions. In order to achieve this goal, species were ranked into five classes based on their thermal preferences with a numeric coefficient for each class: Cold (1), Cold-Cool (2), Cool (3), Cool-Warm (4), Warm (5). The percent of individuals within each class was then weighted by the numeric class, summed across classes and multiplied by two to expand the range (Table 1). This metric produces a numerical value called a Thermal Fish Index (TFI) score which can range from 2.0 representing the coldest assemblage to 10.0 representing the warmest assemblage.

Table 1. Example of proportional abundance shifts of individuals within a thermal class, across the five thermal classes, and the resulting thermal fish index (TFI) score. Proportional abundance summed across rows equals 1.0 (100%) of all individuals within an assemblage.

Cold	Cold-Cool	Cool	Cool-Warm	Warm	
1	2	3	4	5	TFI Score
1.00					**2.0**
0.60	0.30	0.10			**3.0**
	0.60	0.30	0.10		**5.0**
		0.60	0.30	0.10	**7.0**
		0.10	0.30	0.60	**9.0**
				1.00	**10.0**

T. Wertz and M. Shank electrofishing in a small headwater stream with a 'low ceiling'. Photo credit C. Custer

During the development of a TFI-based bioassessment tool, the TFI score responded significantly to changes in habitat, water quality and temperature. When habitat and water quality is degraded, or when instream temperature is increased, the TFI score increases. This response was desired and works on the underlying concept that as anthropogenic stress increases at any given stream size the "cooler" species are displaced/replaced by "warmer" species (Figure 1). The TFI not only provided a numerical response to anthropogenic stress, it also provided for a numerical thermal definition of the entire assemblage where: TFI ≤ 5.0 is a cold water assemblage, TFI 5.1 – 7.0 is a transitional assemblage and TFI > 7.0 is a warmwater assemblage.

Using standardized collection protocols for fishes in both wadeable and nonwadeable (boat electrofishing) streams across Pennsylvania, a TFI score can be generated to provide insight into stressful waterbody conditions and provides both a narrative and numerical classification of the thermal assemblage. The TFI overcomes many of the challenges relating to longitudinal and inter-basin distributions and can be used in lotic waterbodies throughout Pennsylvania, regardless of size or basin. In the future, the TFI may have a place at both Continental and Global scales by providing a standardized scoring metric across State/Territorial boundaries as well as provide a baseline characterization for global climate change monitoring.

'Natural pipe discharge' in Swift Run - tributary to Penns Creek. Photo credit M. Shank

The White Clay Creek: A Pennsylvania Stream Responds to Reforestation

By: Lamonte Garber
Watershed Restoration Coordinator
Stroud Water Research Center

Flowing through Chester County's mushroom region, White Clay Creek is a heavily branched stream that meets the Christina River before joining the Delaware River near Wilmington, Delaware. In its Eastern Branch headwaters, the creek is the subject of a restoration study on a time scale rarely applied to streams or rivers anywhere in the world.

Stroud Water Research Center, located along the East Branch of White Clay Creek in Avondale, Pennsylvania, studies streams and rivers throughout the Commonwealth, the U.S., and the world. In 1981, the Stroud Center and this nearly 2,000 acre drainage basin were designated an Experimental Ecological Reserve by the National Science Foundation (NSF). This designation recognized that an internationally acclaimed freshwater research facility, paired with a relatively healthy Piedmont stream, offered a rare opportunity for long-term experimental research on a watershed ecosystem that is an outstanding representative of its type.

The East Branch of White Clay Creek is classified by the Commonwealth of Pennsylvania as an Exceptional Value stream and watershed. This is the highest classification given and affords the watershed special protection against environmental disturbance of anthropogenic origin. In 1998, the White Clay Creek experimental watershed, extending from the Stroud Center north to the headwaters, was designated as a site for long-term research in environmental biology (LTREB). The NSF's LTREB program recognizes that many important questions in ecology require long-term data. NSF funds help the Stroud Center maintain an ongoing research project examining stream and watershed characteristics associated with reforestation of its riparian zone. Collection of physical, chemical, and biological data (including fish and macroinvertebrate communities) provides a comprehensive picture of a watershed's response to riparian reforestation absent other forms of stream channel and floodplain restoration practices.

Left: American eels are common in White Clay Creek and in freshwater streams from South America to Iceland. They are born in the Sargasso Sea and migrate into freshwater to grow to adult size. They will then return to the Sargasso Sea to spawn. The eel in the photo is fairly close to full size - the largest eels we've found were over 60 cm. Eels are hard to spot - they are nocturnal so they'll be hiding during the day, often under roots or woody debris or in muddy slow moving areas of the stream. Without our electrofishing equipment, we would not be able to capture them. The phrase "slippery as an eel" is very accurate. Their skin is protected by a mucus layer making them nearly impossible to hold.

Right: Fish-related research in the LTREB project includes community surveys, stable isotope analysis for food-web studies, and movement studies done with mark-recapture. These are all conducted by electrofishing.

Photo credit SWRC Entomology Lab

Left: Brown trout are the top of the food web in the White Clay. We have a naturally reproducing population (versus other areas of White Clay where trout are stocked from a hatchery). At Stroud, we say "trout grow on trees" because they are thermally intolerant and need healthy cold water streams to survive, and many of the insects they eat feed on tree leaves. This trout is about to have a tissue sample taken for isotope analysis. We will take a small snip from the caudal fin which will grow back within a few months. recapture. These are all conducted by electrofishing.

Right: Fish-related research in the LTREB project includes community surveys, stable isotope analysis for food-web studies, and movement studies done with mark-recapture. These are all conducted by electrofishing.

Photo credit SWRC Entomology Lab

The White Clay Creek watershed, like most of the Eastern North American landscape, experienced dramatic anthropogenic disturbances over a relatively short time period (300 years). These are characterized by deforestation for lumber, charcoal, and agriculture, and more recently increases in impervious surfaces, pesticide, fertilizer, and snow melt product usage, and atmospheric deposition of nitrogen from the combustion of fossil fuels. These landscape and land use changes have stressed stream ecosystems, yet little is known about how streams in the Piedmont physiographic province have responded to these stresses. Even less is known about how streams respond as the disturbed landscapes recover.

Changes in riparian zone vegetation have been pronounced. When the Stroud Center was established in 1967, the agriculturally dominated watershed contained an upstream riparian forest of 60 to 100 year old trees and downstream meadows subject to cattle grazing. Initially, several long-term sampling reaches on White Clay Creek were selected, including protected woodland and meadow reaches. When cattle were removed from the meadow reach adjacent to the laboratory, the riparian zone became overgrown by multiflora rose (Rosa multiflora), an invasive plant introduced into the U.S. in 1866.

In 1989, the Stroud Center began a riparian zone reforestation project with the goal of reestablishing a contiguous deciduous forest from the meadow reach to headwater spring seeps. Multiflora rose plants were uprooted, tree seedlings of native species were planted, and groundwater and in-stream sampling sites were established. Farther downstream, the Stroud Center maintains a long-term meadow reach without trees as a third riparian condition for study.

For more information on the Stroud Center's many research projects in freshwater ecology as well as information on riparian reforestation science and practice, visit www.stroudcenter.org.

Recent Publications

Moyer, G.R., S. Bohn, M. Cantrell, and A.S. Williams. 2019. Use of genetic data in a species status assessment of the Sicklefin Redhorse (***Moxostoma*** sp.). Conservation Genetics 20:1175–1185.

https://doi.org/10.1007/s10592-019-01202-3

Abstract

Under the United States Endangered Species Act, a species is granted protection if it is in danger of extinction throughout all or a significant portion of its range. Since 2016, the United States Fish and Wildlife Service has adopted a more analytical approach to determining significant portion of its range. Termed Species Status Assessment (SSA), this approach addresses whether loss of individuals from a portion of its range will influence at least one of the conservation biology principles of redundancy (ability to withstand catastrophic events), resiliency (ability to withstand stochastic events), and representation (ability to adapt over time to long-term changes in the environment). Using Sicklefin Redhorse (Moxostoma sp.), we illustrate the use of genetic data to evaluate each SSA metric. We sampled (n = 382) Sicklefin Redhorse from three major river basins throughout its contemporary distribution and estimated genetic parameters using ten microsatellite markers. Using STRUCTURE analyses, we showed that redundancy was three, but our approximate Bayesian computation analysis revealed that this value could be reduced to two if admixture, due to anthropogenic stressors of the 1900s, continues. We used estimates of effective population size (Ne) to measure resiliency and representation and found that all populations showed resiliency and representation with Ne ≥ 479. Genetic monitoring of the Little Tennessee and Tuckasegee populations will be necessary to assess the future status of redundancy for this species. Any reduction in redundancy would warrant further ESA evaluation.

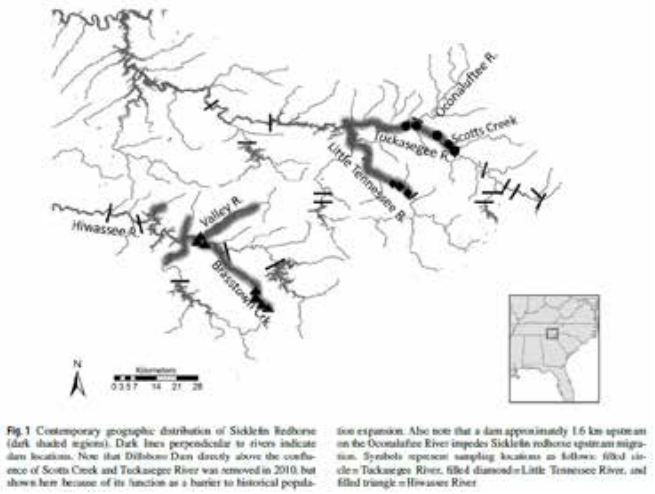


Fig. 1 Contemporary geographic distribution of Sicklefin Redhorse (dark shaded regions). Dark lines perpendicular to rivers indicate dam locations. Note that Dillsboro Dam directly above the confluence of Scotts Creek and Tuckasegee River was removed in 2010, but shown here because of its function as a barrier to historical popula- tion expansion. Also note that a dam approximately 1.6 km upstream on the Oconaluftee River impedes Sicklefin redhorse upstream migration. Symbols represent sampling locations as follows: filled circle = Tuckasegee River, filled diamond = Little Tennessee River, and filled triangle = Hiwassee River

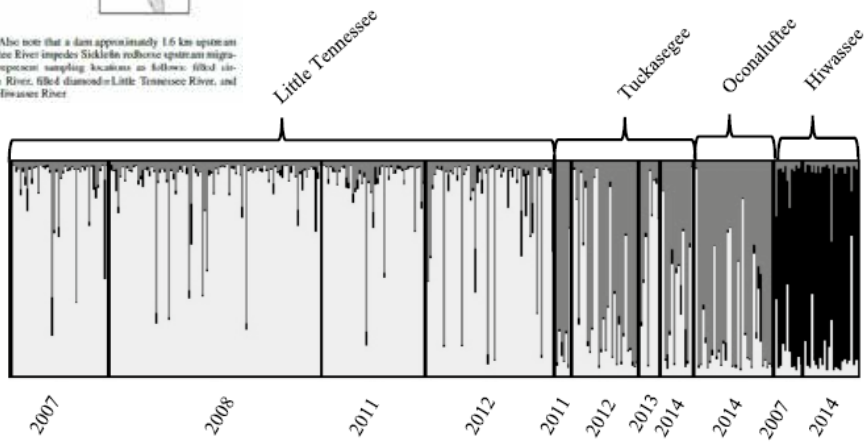


Fig. 4 STRUCTURE output when the number of putative populations (K) = 3. Twenty replicates were averaged in CLUMPP v1.1.2 (Jakobsson and Rosenberg 2007) and visualized in DISTRUCT v1.1 (Rosenberg 2004). Each shaded vertical line represents one individual, with black vertical lines separating sample years (numbers below figure). Light gray represents ancestry attributed to the Little Tennessee River population, medium gray represents ancestry attributed to the Tuckasegee River population, and dark gray represents ancestry attributed to the Hiwassee River population

Recent Publications

Wertz, T.A., and M.K. Shank. 2019. Land use from water quality: development of a water quality index across Pennsylvania streams. Ecosphere 10(11):e02947.

https://esajournals.onlinelibrary.wiley.com/doi/full/10.1002/ecs2.2947

Abstract

Anthropogenic stressors to lotic environments are diverse and often act in complex and synergistic ways through space and time. The need to adequately quantify and communicate these stressors in lotic environments is important for assessing stream health and informing management decisions. We used 21 physicochemical parameters from water quality samples and weighted each parameter by relationships with land use to develop a water quality index (WQI) across lotic environments in Pennsylvania. Four dominant land use categories were identified from water quality analysis: forested, urban, agriculture, and land disturbance. These categories were indexed (0–100) with low scores representing disturbed and high scores representing least-disturbed conditions for each land use category. We propose an interpretation and validation schema for establishing an overall measure of stress, while providing insight into both expected and unexpected sources of stress. The WQI was highly correlated with land use at a coarse scale, where scores decreased in response to non-forested landscapes. We then present two case studies that serve as examples of stressor quantification and communication. In addition to outperforming static measures of land use/cover, the resulting WQI serves multiple functions by communicating stream health to policy makers and citizens in an easily understood form, providing a stressor gradient for biological assessments and measuring stream condition across Pennsylvania's diverse water resources.

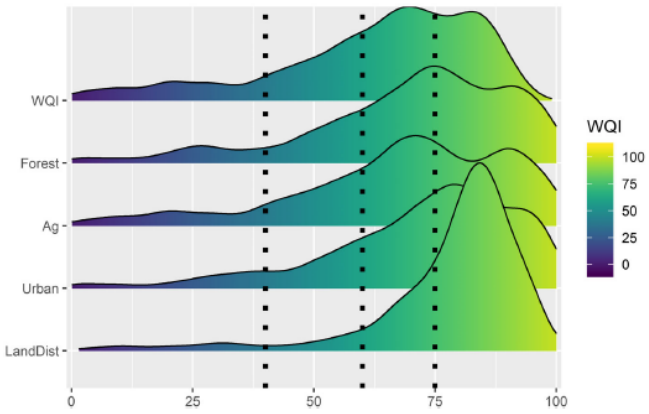


Fig. 5. The distribution of sub-water quality index scores and final water quality index score (WQI). Dotted lines denote the separation of grades: poor, fair, average, and good from left to right based on the range of the overall WQI score.

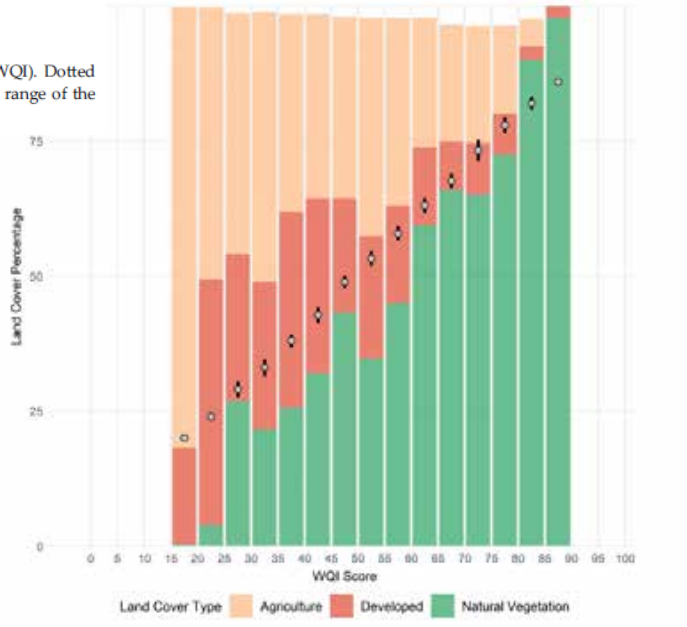


Fig. 6. Mean percent land cover within five-point water quality index (WQI) intervals. Bars indicate percentage of land cover by type, and points represent mean WQI score within the same intervals. ±1 standard deviation is indicated by error bars around points. Bars near the extremes were removed due to a reduced sample size.

Member Spotlight

Chris Custer, PhD Student at Penn State University

My name is Chris Custer and I am entering my first year of the PhD program in Ecology at Penn State where I will be working with Dr. Ty Wagner as my advisor. I come into this new opportunity through perhaps an unconventional path. Starting at the University of Florida, I earned my B.S. in Wildlife Ecology and Conservation, followed by a couple internships where I monitored nesting shorebirds for the city of Jacksonville and worked in the NOAA Shark Lab. After these, I decided to further enhance my education by earning a B.S. in Statistics from the University of North Florida and then a M.S. in Statistics from the University of Alaska, Fairbanks. My goal and research interests throughout my academics were always rooted in quantitative fisheries, yet I didn't quite land there. After my master's, I landed a job back in FL as a Data Scientist for a small marketing consulting firm and then eventually a position as a Research Analyst (Statistician) for UNOS in Richmond, the organization responsible for maintaining the organ transplant network and guiding the policy behind it. While an interesting and rewarding position, I knew I needed to get back into fisheries to fulfill my passion, which eventually led me to Dr. Wagner's lab. I am very excited and grateful for this opportunity as I continue down my path to a career in quantitative fisheries.

My research interests lie broadly with quantitative fisheries, particularly areas with strong management and conservation implications. Our initial research will focus on modelling stream fish communities in Pennsylvania through the use of joint species distribution models. These models are interesting because they allow for analysis of species distributions with respect to both environmental covariates and species interactions. This allows for a more complete understanding of community structure when compared to occupancy models or species interaction models alone. I'm also particularly looking forward to the collaborative nature of project, where I will be working alongside scientists from academia, state and federal agencies. As a student who hasn't been in the field of ecology for some time, I know this opportunity will be hugely beneficial to me. Beyond this, the remainder of the research required for my PhD degree program is still to be determined. I'm looking into other areas of quantitative fisheries, possibly something along the lines of stock assessment.

Outside of school and work, my hobbies often take me to the water, too. I've enjoyed fishing for quite some time and more recently discovered a love for fly fishing. I also enjoy paddleboarding and often combine the two for a great day on the water. I also love food and enjoy cooking and going out to eat with my girlfriend. I'm also a big fan of sports (watching and playing), particularly football and basketball.

Member Spotlight

Mary 'Jill' Kemp , Environmental Educator Specialist at Nolde Forest Environmental Education Center

I first became interested in river chub when my husband (Stan Kemp, U. of Baltimore) called me from a trip in the Great Smokey Mountains describing a beautiful aggregation of minnows on top of a pebble mound in a mountain stream. It was not until later in his studies on urbanization when Stan discovered that similar fish had been present historically but extirpated from the highly urbanized streams in Baltimore. With that information, we began looking for nests and aggregations of river chub around Baltimore and southern PA. At that time, I was working in the field of industrial hygiene and would go out on weekends with him searching for signs of these fish and their small pebble mounds. The first time we saw colorful rosy faced shiners atop of a river chub nest was glorious! So beautiful! Thus, began my project of studying fish behavior of these seemingly very generous fish – the river chub – allowing so many other species to actively spawn on top of their nest while building and spawning themselves!

The learning curve was steep. Before this project, I had little experience with fish behavior research although I had a BS in marine biology from Florida Institute of Technology ('86). I had spent time working at the Baltimore zoo where I learned that humans and animals were very much alike in motivation and actions. Later, I was hired to investigate impacts of beach re-nourishment on sea turtles and their nests on the east coast of Florida. With that data, I went on to complete a master's degree at Florida Atlantic University ('95). Life, love, and family happened and I wound up living near to where I grew up (MD/PA) without a sea turtle in sight. Part-time educator, greeting card creator and environmental shadow puppet shows were part of my odd undertakings before working full time in industrial hygiene then switching in 2014 to being an Environmental Educator Specialist for the PA state park Nolde Forest Environmental Education Center – where I currently work during the school year (when there is not a pandemic going on). This freed up my summers to voluntarily assist and study interactions upon river chub nests in videos that we collected while doing river chub nest surveys. It can be incredibly time consuming to watch and document frame by frame behaviors but I feel it is important to understand inter- and intra-species relationships in order to ascertain what is required for these fish to not only exist but to thrive.

Above: Jill on Big Elk Creek.

Below: 'Mr. Sprinkles', the river chub, surrounded by common shiners

We know that they are disappearing at an alarming rate from many systems possibly due to land use and stormwater issues. Climate change is only making the situation worse.

Another project that I am involved in locally is documenting the dwindling population of box turtles using non-invasive techniques of photographic identification (– much like we do with river chubs and common shiners!). Also, I work with Angelica Creek Watershed Association to help monitor water quality and educate folks on the importance of land use choices to all the organisms that use water including ourselves. I suppose I am a bio-tech at heart, but the urgent need for public science education brings me out of my 'shell' to try to prevent further environmental loss.

Member Spotlight

Megan Kepler Schall, Assistant Professor of Biology at Penn State Hazleton

Megan Kepler Schall has been an AFS member for ten years dating back to before her time as graduate student. Since then, she has completed an M.S. degree in Wildlife and Fisheries Science and a PhD in Ecology both from Penn State University. During her time as a graduate student, she served as the student representative for the Pennsylvania Chapter of the American Fisheries Society (2016-2017) and has presented her research at numerous Spring Technical Meetings throughout the years. Most recently, one of her undergraduate students, presented a poster at the 2020 Spring Technical Meeting showcasing the history and recent remediation of acid mine drainage impaired streams.

After completion of her dissertation, Megan was hired as an assistant professor of biology at Penn State Hazleton in 2018. At Penn State Hazleton, she teaches introductory biology courses and general education biology courses. In addition to her teaching, she continues to be active in fisheries research. Current research areas include investigating fish health and population ecology of Smallmouth Bass in the Susquehanna River Basin and recently funded work on invasive Flathead Catfish in the Susquehanna River Basin. Megan has worked on various research topics relating to fish health and fish ecology including topics such as DNA barcoding for fish identification, population genetics, movement ecology, and parasite prevalence modeling. In her current role at Penn State Hazleton, she has set up a molecular genetics research lab and is continuing to work on interdisciplinary research that integrates fisheries ecology with fisheries management. Importantly, she works to mentor and involved undergraduate and graduate students in her research through independent studies, graduate student advising, and graduate research projects.

In her free time (which can be hard to come by), Megan enjoys spending her time outdoors in any way possible with her husband and golden retriever, Lily.

Dr. Megan Kepler Schall with a current and former study organism, the smallmouth bass (*Micropterus dolomieu*)

Sub-Unit Updates

News from California University of Pennsylvania Sub-Unit

From advisor Dr. David Argent:

"As we are in the midst of COVID, we have not been terribly active. With that said, we did a socially distanced float trip from Whitsett to Cedar Creek Park on the Youghiogheny River about a week ago. Pictured are two members of our chapter: Emily Niper and Morgan Kuhla. It was actually pretty cool because we got to float right over a few 40" muskie, schools of golden redhorse, and see all sorts of darters fleeting about. In addition, we saw soft shell turtles and a lamprey. All in all a great trip."

T-Shirt Sales

PA AFS is selling t-shirts to raise money to support future Cooper Award Winners.

The PA AFS Cooper Award was created to honor the memory of the late Penn State Professor Emeritus of Zoology, and famed author of Fishes of Pennsylvania and the Northeastern United States, Edwin Lavern Cooper, Ph.D.

Under this award program, PA AFS will provide a travel award of $250 - $500 (dependent on number of applicants) to a deserving Pennsylvania graduate and/or undergraduate student annually to present a podium or poster presentation at the national AFS Conference.

In order to ensure funding is available for the Cooper Award, the Excomm has made t-shirts available. Please email us at pachapterAFS@gmail.com to order. This is a great way to support the chapter, make an investment in future scientists, all while looking great!

Dr. Edwin L. Cooper.

Back

Front

PA AFS on Twitter!

PA AFS Excomm has created a Twitter Account

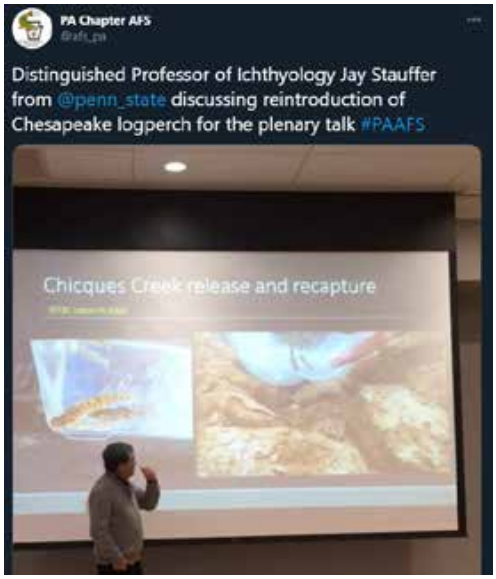
#PAAFS

In addition to traditional email blasts, we will be making announcements regarding Chapter business and upcoming meetings via twitter.

We'll also be highlighting the efforts of Chapter Members and featuring the contents of this newsletter.

Twitter is a great way to stay up to date with the latest in research, developments with national AFS, and much more!

Follow us @afs_pa to stay informed!



National AFS Update

2021 AFS Meeting in Baltimore!

[Submit your Symposium proposal or oral/poster presentation]

AFS is celebrating our 150th anniversary! PA AFS will be participating in a display of PA's rich fisheries scientist heritage. Contact the Chapter if you would like to help out!

JOIN THE NATIONAL AMERICAN FISHERIES SOCIETY TODAY!

DOWNLOAD THE AFS JOURNALS APP!

CHECK OUT THE NEW TITLES IN THE AFS BOOKSTORE!

CHECK OUT THE LATEST AT THE AFS WEBSITE

Photo Corner

(L-R): Caroline Benfer, Nick Smith, Eimile McKinnon with wild brook trout.

(L-R): Nick Smith, Eimile McKinnon electrofishing a reach.

Logan Stenger, Watershed Specialist at Huntingdon County Conservation District partnered with the Juniata College Fisheries and Aquatic Science Program to complete 11 fish surveys in the Upper Standing Stone Creek watershed. These surveys were completed as part of a project to write a Coldwater Conservation Plan for the Upper Standing Stone Creek watershed. Three student interns that work under Dr. George Merovich assisted with the surveys. Overall, the crew was able to capture and identify 30 species from across the watershed.

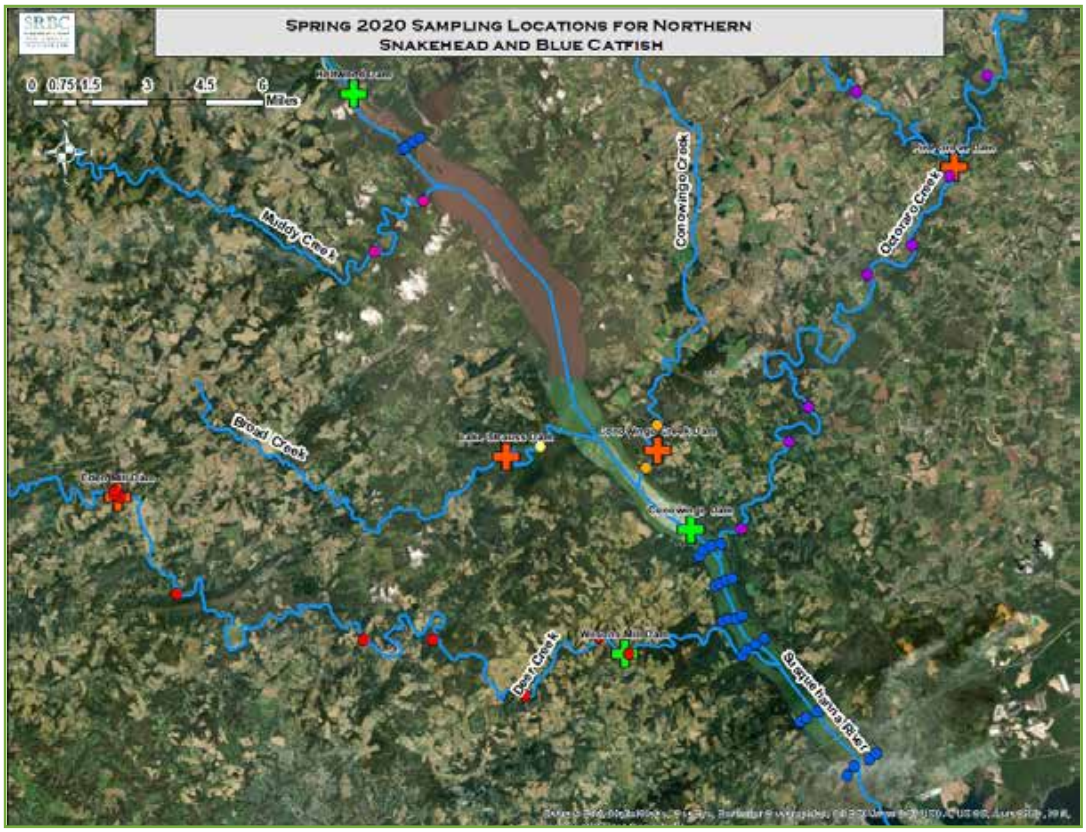
Mountain redbelly dace (Chrosomus oreas) captured from a tributary to Standing Stone Creek. This is a nonnative minnow introduced to PA from WV. It is only found in two streams in PA, both are located in Huntingdon Co. It is unknown how the species was introduced or how its presence impacts local minnow populations.

Logan Stenger, Huntingdon CCDWatershed Specialist, and recent Juniata College graduate, led the sampling team and is pictured reviewing some fish identification.

A 14" wild brown trout (*Salmo trutta*) captured from a headwater site in the Standing Stone Creek watershed

Photo Credit: L. Stenger

Photo Corner



SRBC is collaboratively investigating the presence of Northern Snakehead and Blue Catfish in the lower Susquehanna River watershed.

Top: A map of the study area and sampling sites for the project.

Masked Man Aaron Henning collecting a water sample for eDNA analysis in Deer Creek near Darlington, MD.

SRBC lab set up to filter eDNA samples collected throughout the lower Susquehanna River Basin to identify range of Northern Snakehead and Blur Catfish. Samples are currently being analyzed by USFWS Genetics Lab in Lamar, PA.

Photo Credit: L. Steffy

Photo Corner

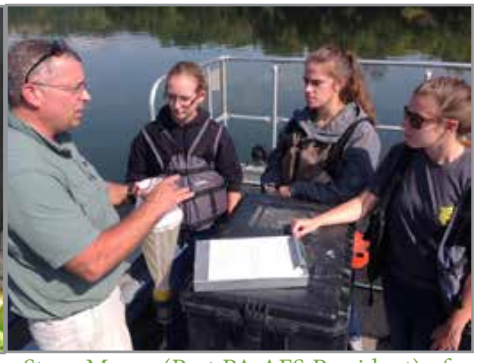
Susquehanna University
Freshwater Research Institute (FRI)

The SU FRI conducted stream sampling this summer under established COVID guidelines. Some of our pictures attached from our sampling of habitat structures placed in agriculturally impaired streams. The structures were placed by Northcentral Pennsylvania Conservancy, PFBC, DEP, and Northumberland and Montour county conservation districts as part of their Stream Habitat Partnership.

Photo Credit: J. Niles

Photo Corner

PA AFS President Greg Moyer taught a week long Conservation Genetics course for USFWS at their National Conservation Training Center in July 2019



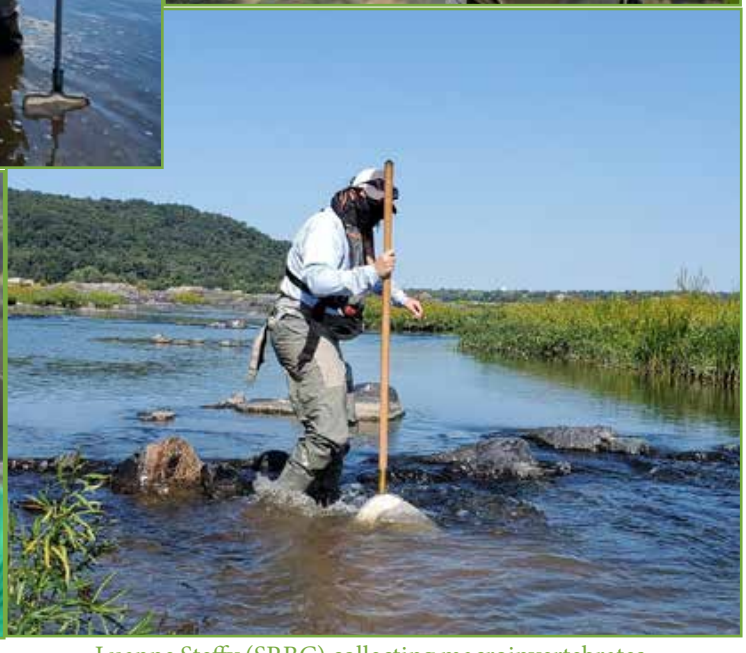
Steve Means (Past PA AFS President) of PA DEP assisted Mansfield University Fisheries with lake surveys on Hammond Lake in the Fall of 2019

MASKED MONTAGE

(L-R): Doug Fischer, Geoff Smith (PFBC), and Aaron Henning (SRBC) electrofishing on the lower Susquehanna R. Photo courtesy @ichthyoAaron

Tim Wertz (PADEP) with a brown trout on Slab Cabin Run

(L-R): Matt Shank, Rebecca Whiteash, and Mark Hoger (PADEP) servicing sondes on the Susquehanna R.



Luanne Steffy (SRBC) collecting macroinvertebrates on the Susquehanna R.

New PA AFS Officers

A special welcome to our newly elected 2020-2021 Chapter Officers!

EXECUTIVE COMMITTEE MEMBER

Tyler Grabowski - Tyler is currently a Fisheries Biologist with the Pennsylvania Fish and Boat Commission in Fisheries Management Area 6 (Southeastern Pennsylvania). He received his BS in Biology with a concentration in Fisheries from Mansfield University and then went on to work as a Graduate Research Assistant at the University of Illinois apart of the Wahl Lab with Illinois Natural History Survey. His graduate work focused on how climactic process and changes may influence fisheries, namely warm-water reservoirs. Fortunately, as Tyler was finishing up his thesis, a position opened in his home region at the PFBC and he was able begin his career at the PFBC earlier than expected. Presently at the Pennsylvania Fish and Boat Commission, Tyler serves as the principal biologist for Pennsylvania's Striped Bass Spawning Stock Assessment in the Delaware Estuary along with many other diverse roles assisting on both lotic and lentic surveys on inland fisheries management. In his free time, Tyler enjoys fishing, primarily in bass tournaments, along with gardening.

STUDENT REPRESENTATIVE

Emily Bierer - Emily is a graduate of Hiram College (2015) and Miami University (2017) with both an undergraduate and Masters degree in Biological Sciences with and emphasis on education. She is starting her PhD at Duquesne University in the fall with the intention to work with the coloration of darters in Pennsylvania. Emily's past research has focused on water quality and species diversity in aquatic environments. Outside of academics, Emily enjoys hiking, swimming, nature photography, playing with her dog and educating the public about science!

PA Chapter Officers
Chapter President: George Merovich
President-Elect: Adam Slowik
Past President: Greg Moyer
Secretary/Treasurer: Sara Mueller
Executive Committee: Matt Shank
Executive Committee: Tyler Grabowski
Student Representative: Emily Bierer

Contact us: https://twitter.com/afs_pa
pachapsterafs@gmail.com

AMERICAN FISHERIES SOCIETY
PENNSYLVANIA CHAPTER