OH-PA-WV Chapters of the American Fisheries Society Joint Meeting 2025

Book of Abstracts

March 4–7, 2025

Wheeling, West Virginia

OH-PA-WV American Fisheries Society Joint Meeting

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Plenary

Hornyheads, Madtoms, and Darters: Narratives Promoting Public Awareness of our Freshwater Fauna

Stuart A. Welsh[33]

A nature lover's paradise, Central Appalachia supports a diversity of life in an extensive network of waterways and is home to a dazzling array of fish species. This presentation will include stories from *Hornyheads, Madtoms, and Darters: Narratives on Central Appalachian Fishes*. The book is a collection of essays on nature, naturalists, and the natural history of fishes. A focus is not only on the fascinating things that fishes do in their natural habitats, but also on promoting public awareness of our fish fauna.

Oral Presentations

Influence of the Invasive Round Goby on Common Logperch Diet in the Western Lake Erie Basin

Emmerson Amy[8], **Brian Alford**[31]

In 2024, we assessed spatiotemporal changes in Common Logperch diet pattens as a consequence of Round Goby invasion in Lake Erie and its tributaries in Ohio. We seined logperch (n=131) and gobies (n=170) in rivers and Lake Erie islands where they co-occur, and we sampled logperch upstream of dams in rivers where gobies currently do not coexist with logperch. Additionally, we analyzed diets from logperch museum specimens taken from the same river and Lake Erie locations to see if logperch diets may have shifted over time, potentially as a result of goby invasion. We euthanized and preserved fish specimens to dissect and analyze gut contents in the lab (n= 5,107 prey). For contemporary collections, benthic macroinvertebrate samples were also taken at the same locations and times when fish were sampled (n=3,713). We compared proportions of invertebrates in the diet to those available in the resource base at all sites for gobies and logperch. We calculated proportional similarity and Levins' niche breadth to assess the degree of diet specialization for both species at all sites. We used Strauss' index of electivity to determine prey taxa selected for or against. We also assessed dietary overlap using the proportional similarity index and PCA. Both species' diets in Lake Erie were dominated by larval chironomids, amphipods, and invasive spiny water fleas. In the Portage River, chironomids dominated fish diets, but logperch ate many larval baetid and heptageniid mayflies and hydropsychidae caddisflies. Logperch and goby diet overlap was high (PS>0.90) in lake and river tributaries. Historic logperch diet analysis show there may have been a shift away from chironomids to more invasive water fleas in the lake and to other insect families in rivers. Lake Erie logperch may have suffered more impacts from interspecific competition from Round Goby, whereas riverine logperch can partition diet to other taxa that are more available in rivers compared to the lake.

An Introduction to the Union City Aquatic Conservation Center

Josh Arnold[23]

Run by the Pennsylvania Fish and Boat Commission (PFBC) the Union City Aquatic Conservation Center (UCACC) is the first “hatchery” in the state to focus not on raising gamefish but several non-game taxa. The main focal point of the UCACC is the propagation and rearing of freshwater mussels (Order: Unionid) to be stocked out in several watersheds in the Ohio River Drainage. From its start in 2018 the UCACC has worked with 9 species of freshwater mussels and has stocked roughly 25,000 freshwater mussels to date. The facility currently has plans to start working with two federally endangered species of freshwater mussels Northern Riffleshell (*Epioblasma rangiana*) and Clubshell (*Pleurobema clava*) in 2025 and to stock >35,000 mussels in the next three years. In addition to working with freshwater mussels, the UCACC currently works with one fish species, the Chesapeake Logperch (*Percina bimaculata*) with the goal of propagating this species to release juveniles into the species’ historic range This is part of a larger partnership between PFBC, USFWS, and Penn State University to facilitate the recovery of the Chesapeake Logperch. As for reptiles, the UCACC currently works with the Blanding’s Turtle (*Emydoidea blandingii*) the rarest turtle species in the state of Pennsylvania. The UCACC has been head-starting this species for two years and to date has released 13 juveniles and plans on releasing an additional 20 this summer. The goal of this project is to reintroduce Blanding's Turtles into it historic range and in the future have a successful breeding population.

Long and Short of it: Length-Weight Relationships and Patterns in Genus vs. Species in the Mid-Atlantic

Sara Ashcraft[29]

Length-weight relationships (LWR) of fish species are often used across disciplines from quantifying ecosystem services to understanding stress response to local conditions. However, there is little information on native fish LWR from the Mid-Atlantic Slope drainages, which have less biodiversity than the inland Mississippi drainages. We conducted backpack electrofishing surveys across subbasins, stream orders, and land use within the West Branch Susquehanna River basin from 2022 to 2024. These surveys included electrofishing 100 m sites, identifying fishes to species, measuring total length (mm) and weight (g) for the first 30 individuals of each species, and detailed habitat and substrate surveys. From these surveys we calculated log-transformed length-weight regression models for 17 species with $n > 60$ individuals. Based on these models, we also investigated the genus vs. species-level patterns in LWR, with consideration for challenges in species identification (Cottus) and hybridization (Lepomis). LWRs will help us conduct further research with body condition, functional assemblage, and habitat to explore the local context-dependent ecosystem.

Mapping Non-Native Trout Stocking Locations and Vulnerable Native Eastern Hellbender known Populations to Inform Fisheries Management Policy in Pennsylvania, USA

Poushalee Banerjee[35], Chad Greville[35], James Suleski[24], Philip Light[17], John Berger[42], Patrick Shirey[35]

Land-use changes have degraded watersheds worldwide, leading to significant declines in water quality and wildlife populations, notably fish as an important protein source. As an attempt to mitigate this problem, fish have been stocked for centuries in different parts of the world and extensively in North America since the late 1800s. In cases where fish stocking is performed for recreational angling purposes and non-native species are introduced, the native species may be threatened by predation and must compete with the stocked species for food and habitat. Eastern Hellbender, a large, bodied salamander native to the eastern and midwestern U.S., has been a candidate to be listed under the U.S. Endangered Species Act and is protected by agencies in eight states. Besides impacts from watershed change, there may have been a decline in Eastern Hellbender populations who are unable to pick up on the chemical cues given by the non-native Brown Trout and Rainbow Trout. According to the 2018 Species Status Assessment Report prepared by the US Fish and Wildlife Service, these introduced species pose a threat to Hellbenders through predation and competition for resources and have also been designated by the IUCN as a top harmful invasive species. Because stocking supplies socially important recreational fishing and involves huge capital investment in hatchery facilities with Pennsylvania alone spending over $100 million (2020-2028) for hatchery upgrades, the negative ecosystem impacts of this practice have been accepted as a tradeoff to provide angling opportunity and related jobs. We investigate trout stocking across the state of Pennsylvania to identify the regions which overlap with Eastern Hellbender habitat and known Hellbender population locations as well as offer policy recommendations regarding existing management. This analysis will provide the basis to perform risk assessment of trout stocking impacts on native species and to inform fisheries policy.

Road Salt Mixtures Alter the Life History Traits of Lower Trophic Level Consumers

Lena Bauer[36], Ashlynn Benedict[36], Leslie Hintz[36], Mikayla Kindler[36], Brendan Luurtsema[36], William Hintz[36]

The salinity of freshwater ecosystems is rising globally due to human-induced factors such as deicing salts. Studies have shown that an increase in salinity has an adverse effect on the health of freshwater ecosystems by disrupting the food web. The life history traits of lower trophic level consumers like zooplankton are negatively affected by increases in salinity, which can affect energy flow to higher order predators like fish. While NaCl is the most common road salt pollutant, other compounds are used as well, causing zooplankton to encounter a chemical cocktail of salts. Therefore, it is important to understand how these chemical cocktails affect the life history traits of zooplankton, and whether a history of exposure to higher salinity environmental conditions influence their response to future changes in salinity. We conducted an experiment to identify how zooplankton with no exposure and zooplankton with a multigenerational exposure responded to a suite of concentrations of a single salt type and a mixture of salts. Our results suggest that salt mixtures induce greater negative impacts than a single salt type. Reductions in brood number and brood size were inversely related to salt concentration. An exposure history suggests that resistance or resilience may be possible to a single salt type, but an exposure history did not confer greater tolerance to a salt mixture. Our work indicates that environmental policy to protect freshwater ecosystems must include a framework to deal with multiple salt types.

Which One Works? - A Comparison of Ichthyoplankton Sampling Gears in Low Order West Virginia Streams

Cory Bauerlien[41], Halden Edwards[41], Joseph Kingsbury[41], Xander Lamping[41], Kyle Hartman[41]

Larval fish surveys can be used to document successful reproduction and serve as surrogates for assessing system health based on fish early life history characteristics. Various gears and combinations of gear types have historically been employed in different habitats with varying success depending on study objectives. In the present study, we sought to compare ichthyoplankton catches among three different sampling gears (spot & sweep, drift nets, and light traps) used to sample low order stream systems. Specifically, we sought to evaluate (1) which gear produced the highest ichthyoplankton catches and (2) which gear captured the most ichthyoplankton diversity. To do so, we sampled ichthyoplankton communities using each of the three gears at six streams, representatives from the Monongahela and Cheat River drainages in West Virginia, in May-July 2023. Collected fish were preserved on-site with formalin and later identified to the genus level. A total of 1696 individual fish spanning seven families and 16 genera were collected across 162 replicate samples (i.e., 54 samples per gear). We employed generalized linear mixed effects models to compare ichthyoplankton catches and taxonomic diversity among gears (fixed effects) while controlling for site- and site-by-month differences in ichthyoplankton abundance and taxonomic richness (nested random effects). Here, we discuss the preliminary results from these models and make suggestions for future studies that wish to sample ichthyoplankton in similar systems.

Sampling Effort Needed to Detect Changes in Silver Carp Presence in the Ohio River Basin

Leah Bayer[41], Jeff Herod, Brent Murry[41], Maris Weihe, Christopher Rota[41]

The Mississippi Interstate Cooperative Resource Association (MICRA) Invasive Carp Advisory Committee (ICAC) leads multi-agency partnership efforts to prevent, detect, and control invasive carp populations in the Mississippi River Basin. The Early Detection and Evaluation team of the Ohio River Basin Invasive Carp Partnership aims to develop a standardized monitoring framework for invasive carp populations. Specifically, one of the team's objectives is to survey invasive carp presence in upstream areas where they are rarely detected to inform response and containment efforts. As part of this team, we aimed to quantify sampling effort needed to detect Silver Carp in the Ohio River Basin with a high level of certainty, especially in those low-density areas. We used existing adult Silver Carp count data from 2015-2023 in the middle Ohio River Basin to fit a Bayesian occupancy model and obtain estimates of occupancy and detection for a power analysis. The Bayesian occupancy model estimates a pool-level index of abundance, which we allow to vary through time. Within each pool, site-level occupancy probability is influenced by the pool-level index of abundance and habitat. At sites that are occupied, detection probability is influenced by the pool-level index of abundance, gear type, targeted vs. community sampling, and season. Subsequently, we ran a series of power analyses to determine optimal sampling effort needed to achieve a high level of carp detection (0.8-0.95) based on different gear types, sampling strategies, sampling seasons, habitat types, and time spans. Occupancy results show a significant increase in relative abundance in Green River– Markland pools over time. Additionally, site occupancy is highest in tributary habitat, and detection probability is highest when using electrified dozer trawls, applying a targeted sampling protocol, and sampling in the latter half of the year. Presentation of case studies will illustrate field application of sampling recommendations based on the Bayesian occupancy and power analysis methods developed here.

Road Salt Pollution Alters Aquatic Food Webs by Subsidizing Algal Growth and Reducing Top-Down Control

Ashlynn Benedict[36], Brendan Luurtsema[36], Lena Bauer[36], Leslie Hintz[36], William Hintz[36]

Road salt pollution is the main driver of freshwater salinization in regions that experience snow and ice resulting in negative impacts on public health, infrastructure, and aquatic ecosystems. One major ecological impact is the salt induced cascading effect stemming from a loss of zooplankton grazers and a resulting increase in phytoplankton biomass. Changes in the phytoplankton-zooplankton pathway disrupts the movement of energy to higher trophic levels, such as fish. Our research seeks to understand the mechanisms of the salt induced cascading effect. Specifically, we will evaluate whether salt is a stressor or as a subsidy for phytoplankton and whether sublethal salt concentrations inhibit zooplankton grazing rates. We found that some salt types increase the phytoplankton biomass when compared with the control, indicating road salts ability to subsidize phytoplankton growth. Additionally, we found that zooplankton grazing rates were reduced with increasing chloride concentrations, although the rate was dependent on water source and previous exposure history to road salt. Our findings show that increased algal growth can be magnified by salt subsidies and the reduction in top-down effects. These mechanisms may intensify the impacts on lower trophic levels with the potential to extend to the rest of the aquatic food web.

Food Web Structure, Ecological Niche, and Niche Overlap of Blue Catfish and other Sport Fish in Ohio Reservoirs Using Stable Isotopes

Jacob Bentley[31], Stuart Ludsin[31]

The introduction of nonnative predators to generate novel fisheries, while common, has the potential to threaten existing fisheries through mechanisms such as competition. Similarly, stocking success could be hampered by these same mechanisms, highlighting the need to understand the ecological niche and niche overlap of stocked fishes. Additionally, these potential interactions are dependent on food web structure, such as prey availability and energy pathways, which can vary substantially across stocked systems. In Ohio reservoirs, Blue Catfish (*Ictalurus furcatus*) are stocked to create trophy fisheries. However, the potential exists that the success of Blue Catfish will either threaten the success of existing fisheries or threaten the success of the stocking program if niche overlap among species is high. To understand the potential for tradeoffs among reservoir sport fisheries and how they vary with food webs we used stable isotopes (nitrogen, carbon, sulphur) of Blue Catfish, native sportfish (e.g., Channel Catfish, *I. punctatus*; Largemouth Bass, *Micropterus salmoides*; White Crappie, *Pomoxis annaluris*; Black Crappie *P. nigromaculatus*), and stocked saugeye (*Sander canadensis x S. vitreus*) along with common prey items to quantified energy pathways, food web structure and niche overlap. Sport fish and prey items were collected during spring, summer, and fall of 2022-2024 in two Ohio reservoirs: Hoover Reservoir (Blue Catfish established) and Alum Creek Lake (Blue Catfish not established). In Hoover Reservoir, pelagic and benthic energy derived from Chironomids and Gizzard Shad (*Dorosoma cepedianum*) characterize the food web while more diverse prey characterize the food web in Alum Creek Lake. As a result, niche overlap is higher in Hoover Reservoir than in Alum Creek Lake. However, the impact of inter-annual variation adds complexity to interpretation. While more investigation is needed to determine whether interactions occur, our findings provide valuable information regarding how food web structure impacts niche overlap among fishes.

Considering Two New Landscape Variables for Modeling Brook Trout *Salvelinus fontinalis* Abundance: Aquatic Organism Passage and Invasive Brown Trout *Salmo trutta*

John Berger[42]

Brook Trout (*Salvelinus fontinalis*) are a conservation priority across their native range. Two well established threats to brook trout are aquatic organism passage barriers and invasive Brown Trout (*Salmo trutta*) populations. To better understand these threats we developed variables that attempt to quantify their impacts. The efficacy of these variables for modeling Brook Trout populations was evaluated using a two-step regression model. The two experimental variables and other previously established variables were used to create two separate two-step regression models which were each evaluated for goodness-of-fit. In the first model two of the three goodness-of-fit tests demonstrated satisfactory fit between measured and predicted values. In the second model, none of the goodness-of-fit tests were satisfied. Aquatic organism passage is colinear with several stronger predictors which limits its usefulness as a modeling variable. Brown Trout abundance captured new variability and was not colinear with any previously established variables indicating its usefulness as a modeling variable in future work.

Comparison of Blue and Green Pigments in Diverse Darters

Emily Bierer[9], Brady Porter[9]

Coloration of fishes plays an important role in communication, sexual selection, and speciation. Although blue coloration in fishes is typically structural, one blue pigment protein, termed Sandercyanin, was discovered in Walleye (*Sander vitreus*). Sandercyanin is a 21 kDa lipocalin chromoprotein binding biliverdin IX-α as a homotetramer. We predict blue and green pigmentation in darters are homologous chromoproteins to Sandercyanin. We focus on comparing potential causes for the range of blue and green hues in chromoproteins of Rainbow (*Etheostoma caeruleum*), Orangethroat (*Etheostoma spectabile*), Variegate (*Etheostoma variatum*), Banded (*Etheostoma zonale*), and Greenside (*Etheostoma blennioides*) Darters. Comparisons show differences in native protein size and absorption profiles. Spectral analysis resulted in a positive correlation between UV-Vis and fluorescence emission. Mass Spectral analysis of the chromophore in Rainbow and Greenside Darter confirmed both bind biliverdin. We hypothesize that the evolution of darter pigments involves variation in the protein structure. We developed PCR primers to amplify and sequence apolipoprotein D from darter genomic DNA for further comparison to Sandercyanin. Sequence analysis indicates gene size ranges between species due to intron length, while exon number, order, size and primary sequence appears to be relatively conserved between species. Current nucleotide sequencing indicates a gene duplication event while ongoing peptide sequencing of pigments isolated from darter integument will be needed to further support or reject our hypotheses that darter apolipoprotein D is homologous to Sandercyanin, and coloration differences result from protein sequence variation. Ultimately these data will contribute to understanding the evolution of pigments in one of the most colorful groups of freshwater fishes.

Fish Community Response to Culvert Replacement in Western Pennsylvania Streams

Brady Blackburn[12], David Janetski[12], Eric Chapman[42], Eli Long[42]

Aquatic organism passage (AOP) has received increased attention as the repercussions of watershed fragmentation have become better understood. Past research has shown that culverts impair aquatic organism passage and fragment stream habitats, however many of these studies are conducted at the population scale. To better understand the effects of culvert replacements on entire fish communities, we examined how community similarity between locations upstream and downstream of culverts changed over time after culvert replacement. We predicted that culverts identified as barriers would display higher community dissimilarity and that community similarity would increase with time after culvert replacement. In summer 2023 and 2024, electrofishing surveys were completed at culvert sites (n=12) and sites where culverts had been replaced with passable structures (n=20). We used linear regression to test for relationships between time since replacement and Bray-Curtis Dissimilarity, which was calculated at each site using community data from upstream and downstream of the culvert (or replacement structures). We also used ANCOVA to determine how fish passage scores (NAACC) relate to fish community similarity upstream and downstream of existing culverts. Contrary to expectations, we found that fish communities did not consistently become more similar as time passed since culvert replacement. While some replacement sites had similar community compositions, others were dissimilar even 5+ years after restoration of connectivity. Furthermore, patterns of community similarity at existing culverts suggest higher variation in passability than expected from AOP assessments. While more work is needed to explain these patterns, our findings support that restoring connectivity through culvert replacement can often have positive effects on upstream fish communities.

Recovery of Intermittent Stream Communities across Variable Drying Regimes

Lindsey Bruckerhoff[31], Benjamin Kelly[22], Vanessa Rendon[22]

Intermittent streams are widespread, but how fish use and persist in intermittent streams across river networks is not well understood. The extent of drying in intermittent streams can vary spatiotemporally; some reaches completely dry while others maintain isolated pools. Reaches with isolated pools may provide refugia for stream organisms and contribute to community stability while reaches that completely dry require colonization from perennial reaches as streams rewet. We estimated colonization and local extirpation rates using a dynamic occupancy model for nine stream fish species based on repeated community survey in 10 streams across an intermittency gradient (completely dry vs. isolated pools). We then used estimated extirpation and recolonization rates to predict population persistence under simulated drying regimes. For most species, initial occupancy was higher at sites that maintained isolated pools and local extirpation was low during the wet periods. Colonization rates, however, varied among species and drying regimes. In simulations in which all streams completely dried in the summer, 33% of species were predicted to become locally extirpated. Understanding patterns of recovery and recolonization across a gradient of intermittency is critical for prioritizing conservation measures like environmental flow standards or restoration efforts that keep water for aquatic communities on the landscape.

Using Side Beam Hydroacoustics and Community Size Spectra to Create a Tool for Community Level Fish Management

Daniel Bryan[41], Brent Murry[41], Garrett Johnson[32], Benjamin Marcek[32]

Invasive carp have had a profound impact on the fish species distribution and growth in the Mississippi and its tributaries. Studies have shown that invasive carp outcompete native planktivores and negatively impact native fish populations. In addition, invasive carp are difficult to capture with traditional methods. This highlights the need for efficient community sampling. Here we aim to evaluate side beam hydroacoustics and community size spectra as a fish community management tool. Side beam hydroacoustic monitoring records fish target strength, which can be equated to size, using a transducer mounted horizontally on a boat. This data can then be quantified using community size spectra, which describes the distribution of individual fish body size across the entire assemblage with the parameter lambda. Side beam hydroacoustics data were collected across JT Myers, Newburgh, Cannelton, and McAlpine pools of the Ohio River, with additional community data being collected using an electrified dozer trawl for comparison. Lambda generated with community size spectra provides a metric to compare the impacts of sample size and catch bias on hydroacoustics viability compared to dozer trawling. To calculate size spectra, we are using a Bayesian hierarchical model treating fish size as a truncated pareto distribution. To account for fish orientations effects on target strength we conducted a sensitivity analysis excluding non-parallel fish from final size spectra models. Community size spectra was estimated by transforming target strength into total length using Loves equation. This transformation also allows direct comparisons with the dozer trawl. Preliminary results indicate that side beam hydroacoustics provide a robust fish community size spectra, with tight confidence intervals. These results can be used to monitor ecological effects of invasive carp on fish assemblages within the Ohio River, as well as provide a methodology for widespread fish community sampling.

Developing a Statewide Freshwater Mussel Conservation Plan for Pennsylvania

Eric Chapman[42], Trent Millum[42], Nevin Welte[42,23], Jordan Allison[23], Mary Walsh[42]

Western Pennsylvania Conservancy (WPC) partnered with the Pennsylvania Fish and Boat Commission (PFBC) to complete the first comprehensive freshwater mussel conservation plan for Pennsylvania. The overarching goals for the plan are to document current mussel strongholds, watersheds in need of restoration to benefit mussel populations, watersheds that are currently in a state of data deficiency, and watersheds that could benefit from propagation, augmentation, and reintroduction (PAR) activities at the HUC-10 watershed scale statewide. A comprehensive data review was completed on all freshwater mussel records in PA from 1838 to 2024 to determine data gaps and changes in diversity over time. This planning effort has yielded a comprehensive view of freshwater mussel conservation needs across Pennsylvania as well as locations that require additional survey effort or PAR activities. Given how challenging freshwater mussels are to work with there are still significant research questions that need to be addressed, which will be detailed in the statewide mussel plan. Project partners intend to have this plan detailed enough that other organizations can utilize this planning effort for determining where to complete restoration activities (i.e. riparian buffer plantings, aquatic organism passage projects, or agricultural best management practices) that could improve water quality conditions for freshwater mussels and other aquatic species alike.

Private Sector Challenges

Aaron Cushing[27]

The market and need for private fisheries management services is growing nationally. Due to competition, there is a natural void in communication between competing biologists on the unique ways they accomplish stakeholder goals. Fisheries biologists face challenges throughout the management process, including the initial planning, implementation, and long-term commitment. Identifying obstacles early in the planning phase of a project lays the foundation for long-term success. Success involves flexibility when navigating planned and unplanned challenges that must be overcome by both the client and the project manager. Our goal is to improve communication between private sector biologists and raise the standard of service and value of fisheries management services for all clients. We discuss many of these challenges, how they can be identified, and share examples of our learned methods and techniques that have led to both project success and failure.

Evaluating the *Sander* Population of Pennsylvania's Three Rivers System

Michael Depew[23]

Walleye *Sander vitreus* and Sauger *S. canadensis* are two popular sportfish in Pennsylvania's Three Rivers system. However, little work has been done to evaluate the *Sander* populations in the impounded portion of these waters. Using standard night electrofishing protocols, we sampled all 17 tailwaters and one pool on the Three Rivers in early spring, late spring, and late fall to determine abundance, age and growth, and maturity of *Sander*. Results indicated variability in abundance by season, river, and tailwater. Total CPUE for Walleye was highest on the upper Allegheny River and for Sauger was highest on the Ohio River; legal sized Sauger were also captured in the highest rates on the Ohio River. In contrast, catch rates of legal Walleye were highest on the Ohio. Sauger growth rates were consistent throughout the system with fish reaching legal size by age 2. Walleye growth rates varied by tailwater and displayed a declining trend when heading upriver in the system. Sauger generally reached maturity by age 3. Most Walleye females matured at age 5 on the Ohio and Monongahela rivers and age 6 on the Allegheny. Only 3% of sublegal female Walleye were mature indicating that the legal-size limit of 381 mm would not protect most female Walleye from harvest before reaching maturity. However, there does not appear to be any issue with Walleye reproduction in the Three Rivers. In contrast, overabundance of sublegal Walleye on the upper Allegheny tailwaters has led to stunting and low numbers of legal fish. We will continue to conduct surveys on the upper Allegheny tailwaters and expand sampling upstream to the free-flowing Allegheny over the next few years to determine an appropriate set of regulations designed to increase abundance of legal Walleye throughout this portion of river.

Factors Influencing Long-Term Trends in Brook Trout Production in West Virginia Headwater Streams

Halden Edwards[41], Kyle Hartman[41], David Thorne[40]

Brook Trout (*Salvelinus fontinalis*) are an economically and ecologically important fish species across their native range. However, many Brook Trout populations across the southern and central Appalachians have declined over the last century due to a variety of anthropogenic impacts. The factors driving these declines, as well as the factors influencing natural variability in Brook Trout populations, vary by region and are relatively understudied at longer temporal scales in West Virginia. Additionally, few studies have used secondary production, the biomass produced in an area over time, to evaluate differences in Brook Trout populations across the landscape despite the unique insight provided by the metric. Therefore, our primary objectives were to calculate Brook Trout production in a variety of streams in West Virginia and then evaluate long-term spatial and temporal trends in production. Using data collected as part of a two-decade (2003-2024) monitoring project, annual Brook Trout production (g/m2/yr) was calculated for 25 headwater streams in east central West Virginia. Additional environmental data from the study sites were collected as part of the project or compiled from state and federal agencies also working in the area; these data include in-stream habitat measurements, water quality, geology, climate variables, and more. Parameters were added stepwise to linear mixed effect models to determine which factors were associated with changes in production and biomass over time and across the study area. We found significant declines in Brook Trout production over the study period, linked to changes in precipitation and summer temperatures. There were also significant differences in mean production across sites, driven by geology and habitat complexity. These results provide managers with a detailed view of the spatial and temporal variability exhibited by Brook Trout populations in WV and help elucidate the anthropogenic and natural factors driving that variability.

Life History and Habitat: Influences on Larval Fish Growth in River-Reservoir Ecosystems

Justin Furby[31], Casey Pennock[31]

Reservoirs are common anthropogenically created ecosystems that provide novel fish habitat alongside societal benefits including drinking water, flood control, and recreation. Within reservoirs, a longitudinal gradient of connected habitat exists from major river inflows to the dam that vary biologically, physically, and chemically. While many attributes of free-flowing rivers are compromised following impoundment, habitats at reservoir inflows can mimic conditions in unregulated river reaches, such as productive floodplains. Previous research in reservoirs has quantified changes in fish assemblage structure from river inflows to the dam, emphasizing the importance of the lotic-lentic transition for supporting diverse and abundant assemblages. Yet, few studies have quantified abiotic and biotic factors that correlate with these changes and the relative benefit of habitats to fishes. To address this knowledge gap, we evaluated environmental correlates that may influence assemblage structure, abundance, and growth rates of larval fishes across the longitudinal gradient in reservoirs. To assess habitat benefits, we collected a suite of abiotic and biotic data across eight reservoirs in Ohio during summer 2024 ($n = 96$ sites). During the study period, we captured 6,101 larval fishes (≤ 20mm) and 30 unique taxa across sites. We documented significantly higher larval fish abundance in upstream reaches of reservoirs, correlated with increases in available littoral and floodplain habitat ($p < 0.001$). Fish assemblage structure was similar across habitats from river inflows to the dam, and more variable across time as a function of increasing temperature and differences in spawning periodicity. Preliminary analysis of fish growth revealed rates to be highest in downstream reaches of reservoirs with temperature as a significant explanatory variable ($p < 0.01$). Results from this study will provide information on the relative benefit of habitats within novel ecosystems with implications for native fish conservation and management of sport fish populations.

Linking Life History Traits to Conservation Translocation Success in Darter Species

Julia Glandorff[31], Lauren Pintor[31], Brian Zimmerman[31]

Conservation translocation – reintroducing fish into their former native range - is a management strategy widely used to facilitate population recovery. However, fish species exhibit variable responses to translocation efforts, emphasizing the need to learn from past successes and failures to improve future conservation outcomes. In Ohio, the Bluebreast Darter (*Nothonotus camurus*), Variegate Darter (*Etheostoma variatum*), and Tippecanoe Darter (*N. tippecanoe*) have been reintroduced to eight rivers via annual translocation events since 2016, 2020, and 2018, respectively. Despite consistent relocation efforts, these species have shown different reestablishment outcomes. Specifically, the Tippecanoe and Bluebreast darters have dramatically flourished, while Variegate darters have displayed a low population growth rate. While many factors influence translocation success, species-level differences such as life history traits may play a pivotal role due to their influence on survival and reproduction. To investigate this, we examined how variation in body size - a key life history trait influencing fecundity, lifespan, and energetic requirements - predicts population growth rate since translocation. We hypothesize that the smaller body sizes of Tippecanoe and Bluebreast darters confers ecological advantages such as earlier maturation and shorter generations times, that facilitate rapid population growth compared to the larger-bodied Variegate Darter. This study highlights the critical link between life history traits and translocation outcomes, providing evidence that body size is a valuable predictor for reintroduction success. By establishing this connection, our findings offer a simple and practical tool for natural resource managers to design more effective conservation translocations.

Factors Affecting Variation in Fatty Acid Composition of Selected Fishes in Central Ohio Reservoirs

Steven Gratz[20], Jacob Bentley[31], Stuart Ludsin[31]

Fatty acids are vital for human health and affect overall well-being while reducing disease risk. Fish tissue contains a plethora of fatty acids including eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), two essential omega-3 fatty acids, which are primarily found in fish and help the human body to function properly. Little research has been conducted studying the fatty acid composition of freshwater fishes with a majority of research focusing on saltwater fishes. However, it is important to understand the fatty acid composition among freshwater fishes that support locally sourced food. We sought to understand species, size, and seasonal variation of omega-3 and omega-6 fatty acids in Blue Catfish (*Ictalurus furcatus*), Channel Catfish (*I. punctatus*), Largemouth Bass (*Micropterus salmoides*), and saugeye (*Sander canadensis x S. vitreus*) within two central Ohio Reservoirs to help locavores make informed decisions on which type of fish to consume. The tissue type collected and analyzed, either liver tissue and/or belly fillets with skin attached, varied among and within seasons so we sought to understand variation of fatty acids among the two tissue types. We hypothesized that beneficial fatty acid concentrations would vary with environmental seasonal changes (e.g., water temperature) and fish size and species due to differences in feeding ecology. We also expected to observe increasing concentrations of EPA and DHA with an increase in fish size. While understanding the fatty acid composition of different fishes can help locavores make informed decisions, it is dually important to conduct a risk-benefit assessment to ensure that fish have adequate levels of fatty acids while also following fish consumption guidelines to maintain a safe level of contaminant exposure.

Tagging Method for Future Propagation and Release of the Imperiled Big Sandy Crayfish *Cambarus callainus* with a Surrogate Species, Conhaway Crayfish *Cambarus appalachiensis*

James Hartley[10]

Nearly one-third of all 669 crayfish species worldwide are threatened with extinction, 400 of which are native to the United States. The Big Sandy Crayfish *(Cambarus callainus*), native to the Big Sandy River basin within West Virginia, Kentucky, and Virginia, was listed as federally threatened in 2016 . Propagation can be employed to reintroduce and sustain declining populations of *C. callainus* within their native range. Captive care and release of captive-born young have been documented to be successful at both White Sulphur Springs National Hatchery and West Liberty University. Visible Implant Elastomer (VIE) is used frequently in small animals to identify individuals or groups of animals. Tagging captive raised *C. callainus* with VIE can be used to identify individuals released in streams, record success rates, and track genetic lineage. Preventing inbreeding and outbreeding depressions in captive-raised animals is essential to ensure the native stock is genetically fit. Eighty-two Conhaway Crayfish (*Cambarus appalachiensis*) were used as surrogate species to monitor the effects of VIE tags. We found no significant mortality in tagged individuals with significant tag retention in all sizes and developed a protocol for future efforts with *C. callainus*. Thus, VIE may be a safe and inexpensive way to track released *C. callainus* alongside planned propagation and release efforts.

Ohio River Bass Fishery

Kyle Hartman[41], Alex Benecke[41], Levi Brown[41], Dustin Smith[40]

We studied population demographics and tournament trends of black bass in the Ohio River in response to angler concerns about declining quality of the fishery. Bass tournaments along the West Virginia border of the Ohio River are required to obtain a permit and report results to the West Virginia Division of Natural Resources (WVDNR). Using historical tournament catch records we analyzed catch, effort, and species composition since 2001. Ohio Division of Wildlife (ODW) and West Virginia Division of Natural Resources also provided historical electrofishing data for the river. Age-length keys were developed from fish collected by electrofishing in 2020-21. Results showed that the tournament catch of black bass has shifted towards Smallmouth Bass, particularly in the upper river sections. Demographically, there is an absence of Largemouth Bass (LMB) age-5 and older that leads to von Bertalanffy L∞ values of 462 mm. Back calculated size at age of LMB produced Rosa Lee phenomenon, suggesting mortality acting on faster growing individuals. Electrofishing density of quality size bass (1.0-5.4 LMB/h and 2.5-4.2 SMB/h) was low. Between 2005 and 2015 WVDNR stocked LMB and SMB into the Ohio River to augment natural production. SMB stocking had no effect on angler catch rates. However, stocking an annual average of >43,000 LMB between 2005 and 2015 correlated with a significant increase in tournament catch rates. Despite this, annual tournament catch rates (304 mm minimum TL) were poor for LMB -- < 0.15 / h. A better understanding of the causal factors in the Rosa Lee phenomenon, the lack of older larger fish, habitat changes, and the role of angling on nesting and survival are needed to better understand and manage this fishery.

Non-Lethal Sampling Techniques for Fish Health Assessments Using Smallmouth Bass *Micropterus dolomieu*

Lindsey Hartzell[41], Heather Walsh[33], Vicki Blazer[33], Patricia Mazik[33]

In the early 2000s, fish kills of different species, including Smallmouth Bass *Micropterus dolomieu*, were reported in areas of the Potomac River drainage, including the Shenandoah River in Virginia. Since the first reports of fish kills and lesions affecting Smallmouth Bass, they have continued to show signs of adverse health effects. Additionally, in some areas of the Potomac River drainage population declines have occurred, and lethal sampling is disparaged. To test the usefulness of non-lethal sampling, Smallmouth Bass were collected and sampled with both lethal and non-lethal techniques at three sites within the Shenandoah River drainage and one out-of-basin site along the Maury River (located within the James River drainage). Lethal sampling allows for a comprehensive assessment and includes a health assessment index (HAI), organosomatic indices, blood/plasma collection for numerous endpoints, tissue preservation for histopathology and gene expression. For non-lethal methodology development, a deformity, erosion, lesion, and tumor counts (DELTs) was conducted, gill snips were taken in RNAlater for immune-function gene expression, whole blood was collected for contaminant analysis, immune-function gene expression, and blood smears, plasma was extracted for enzyme, protein, and lysozyme analysis, mucus was extracted for detection of Largemouth Bass Virus (LMBV), and portions of the dorsal and anal fin from each fish were sampled for aging. Blood smears will be analyzed for white blood cell type and counts as well as micronuclei and red blood cell nuclear abnormalities. The results of this study will not only be applicable for future Smallmouth Bass studies but will provide relevant health assessment techniques for other species experiencing population declines or under a conserved status.

Restoration of American Eel in the Susquehanna River Basin

Aaron Henning[28]

The Susquehanna River, North America's longest commercially non-navigable river, previously supported considerable stocks of diadromous fishes. The construction of four large hydroelectric dams in the early 20th century effectively eliminated migratory fish movement for nearly a century. The Susquehanna River Anadromous Fish Restoration Cooperative developed an American Eel Restoration Plan in 2013 and concurrently worked with hydropower project operators through the Federal Energy Regulatory Commission's relicensing process to achieve a long-term trap and transport program in the Basin. In less than twenty years over three million animals have been transported upstream. The reintegration of this native keystone species has been monitored and documented by the Susquehanna River Basin Commission since 2010. American Eel are now widely distributed throughout the Basin and are encountered by the general public with increasing frequency. The return of this species has generated considerable interest and driven the need for additional research, outreach and appreciation for the role of migratory fishes in contemporary Atlantic slope fisheries.

Abundance and Habitat Use of the Candy Darter in the Gauley River National Recreation Area

David Hoffman[41], Stuart Welsh[41], Jennifer Flippin[16]

The Candy Darter (*Etheostoma osburni*), a small-bodied fish in the family Percidae, is an endemic and a federally endangered species in the New River drainage of West Virginia and Virginia. One of the designated critical habitats of this species is located within the Gauley River National Recreation Area (GRNRA), a reach of the river impacted by didymo (*Didymosphenia geminata*), where we conducted a study using snorkeling and underwater observation to assess species abundance and habitat use at two riffle sites. Candy Darter abundances differed between sites as determined from N-mixture models, a finding that may be influenced by water temperature or didymo. Within riffle habitats, Candy Darters associated with areas of faster water velocity, higher percentages of cobbles, lower didymo coverage, and lower boulder percentage areas. Our results may aid conservation agencies, as data from the designated critical habitat area of GRNRA can inform management and conservation of the species.

Changes in Functional Diversity of the Upper Ohio River Fish Community: Implications for Invasive Aquatic Vegetation Management

Ryan Hudson[21, 31], Ryan Argo[21]

The Ohio River faces a multitude of anthropogenic stressors including impoundment, commercial navigation, channel modification, watershed land use changes, pollution, and most recently invasive species. Invasive submerged aquatic vegetation (SAV), primarily *Hydrilla verticillata* and *Myriophyllum spicatum*, has proliferated in the upper Ohio River over the past two decades. Changes in the fish community have been observed during this time, with species not typically associated with Ohio River habitats becoming prominent members of the fish community. However, in modified systems like the Ohio River, it can be difficult to draw conclusions as to the primary drivers of community change. We used functional traits to identify some of the factors associated with SAV habitats that may be responsible for driving the observed change in the fish community. We also calculated functional diversity measures to evaluate how this novel niche in the ecosystem may be affecting niche space and competition between historically abundant Ohio River species and newly established species. Considering that there are limited options for SAV remediation, this research raises questions as to how agencies are supposed to assess and manage Ohio River reaches affected by SAV.

Love on the Rocks: Behavioral and Non-Behavioral Factors in Determining Mating Success in Common Shiners *Luxilus cornutus* in NE Maryland, USA

Jill Kemp[18], Stanley Kemp[34]

Mating systems are often complex, involving highly adapted components critical to species reproduction and population survival. Improved understanding of the ecology of mating systems is useful in predicting impacts of human activity on biological communities. The Common shiner (*Luxilus cornutus*) is a widespread fish species in the NE United States with healthy populations overall. However, previous research has shown that this species is vulnerable to urbanization and watershed development. Common shiners and other nest associates aggregate on nest mounds built by River Chub (*Nocomis micropogon*), another species vulnerable to urbanization. Much about these associations is unquantified, unpublished or simply unknown. We sought to better understand these relationships by conducting a study of behavioral and non- behavioral potential factors on mating success of Common shiner nesting on River chub pebble mound nests. River chub nests with Common shiner aggregations were examined for frequency among all nests, number of Common shiner and other nest associates present, and predators. Underwater video from 31 Common shiner aggregations was examined using 10-minute focals of both male and female common shiners. Using open-source behavioral analysis software (BORIS), behavioral and non- behavioral events during the focals were recorded. We analyzed 100 male focals and 29 female focals for determinants of individual mating success (Y/ N) and successful mating rates. Male Common Shiners were found to have several significant factors for mating success, while female common shiners showed little evidence of significant mating factors. Nesting videos contained numerous characteristic sounds. The strength of the observed sounds over background, and their association with significant mating factors suggests sound may also play a role in Common Shiner mating systems; further research is warranted.

Reviving a Lake Erie Icon: Tracking Reintroduced Lake Sturgeon in Lake Erie

Mikayla Kindler[36], Jorden McKenna[32], Justin Chiotti[32], Richard Kraus[33], Eric Weimer[20], John Navarro[20], William Hintz[36]

Lake Sturgeon are considered endangered in Lake Erie and its tributaries by the Ohio Department of Natural Resources due to historic overexploitation, habitat degradation and water pollution. In 2018, a multi-agency effort was initiated to rehabilitate Lake Sturgeon in Lake Erie by releasing 3000 fingerlings per year into the Maumee River – a historic Lake Sturgeon spawning tributary. We assessed survival, movement and habitat use of reintroduced age-0 Lake Sturgeon from 2018-2019 and 2021-2022, using acoustic transmitters (n=160). Across years, monthly apparent survival was 87-97%, which would be sufficient to meet the goal of establishing a population of 1500 adult Lake Sturgeon. In the first three stocking years, most of the juvenile sturgeon left the river and entered the Western Basin of Lake Erie, with detections indicating movement along the southern shoreline within the Maumee River plume and near the Western Basin Reef complexes. In 2022, a larger proportion of the stocked fish stayed within the Maumee River than in previous years. Questions about the fidelity of adult sturgeon to Maumee stocking locations, in part, remain unresolved due to observed variation in river retention and the potential impact on olfactory imprinting. Downstream movement appears to be influenced by river discharge at the time of stocking and the following few weeks. Further analysis into the seasonal, biological, and technical factors which influence fish movement will help to inform future assessments and stocking decisions toward restoration of Lake Sturgeon in the Maumee River and other Lake Erie tributaries.

Age Structures SIRS Epidemiological Model of Largemouth Bass Virus

Joseph Kingsbury[41], Kyle Hartman[41]

Largemouth Bass virus (LMBV) is a ranavirus that can infect multiple fish species, particularly centrarchids, but is only known to be lethal to black bass, particularly Largemouth Bass (*Micropterus nigricans*) and recently Smallmouth Bass (*Micropterus dolomieu*). Initially detected in the early 1990s LMBV has caused several mass mortality events in the United States and continues to spread. Currently, the impact of LMBV on the age structure and population dynamics of wild black bass populations is not well understood. A modified SIRS epidemiological model was created that incorporates age-class based disease parameters and density dependent reproduction in conjunction with observed population dynamics from the Upper Ohio River was used to evaluate 4 potential disease scenarios. Using this model, we were able to ascertain that that the immunity rate within a simulated Largemouth Bass population was a key factor in recruiting older individuals into the population. When immunity to the virus within the population is elevated (rate of 0.8) there is nearly a 6-fold increase in age-5 individuals regardless of disease mortality rates. However, when immunity to the virus is reduced to a rate of 0.2, there was a significant decrease in the number of Age-5 individuals (408-595 : 65-101). Further research is required to understand what factors influence the duration and robustness of immunity within Largemouth Bass and if it can be engineered through vaccination or some other means.

Converting a Standardized Reservoir saugeye and Walleye Gill Net Survey to the North American Standard Gill Net Method: A Gear Comparison Study

Bryan Kinter[20], Stephen Tyszko[20], Jeremy Pritt[20]

The Ohio Division of Wildlife (ODOW) transitioned gill net surveys to North American standard (NAS) methods in 2024. To prepare for this transition, we conducted a paired gear comparison study between ODOW Inland Management System (IMS) gill nets and NAS gill nets for saugeye (female Walleye *Sander vitreus* × male Sauger *S. canadensis*) and Walleye in order to develop correction factors between the two gill-net types. We set equal numbers of IMS (200' long with four panels) and NAS (80' long with eight panels) gill nets in 13 reservoirs in Ohio and used linear regression to develop correction factors between CPUE, CPUE of stock-length fish, proportional size distribution (PSD), and proportional size distribution of preferred length fish (PSD-P). To develop the new protocol, we also conducted a resampling analysis to determine the number of NAS gill net sets needed to catch 100 stock-length saugeye and Walleye and achieve a relative standard error for CPUE of stock-length fish (RSE) ≤ 25. Our regression models indicated strong, positive relationships between net types (R^2 = 0.58–0.83) for our four metrics of interest. The median number of NAS gill-net sets needed to catch 100 stock-length saugeye and Walleye was 21 and the median number of sets needed to achieve an RSE ≤ 25 was 9. Our results show that strong correction factors can be developed between existing sampling methods and standard methods that will allow comparisons using data from both gears. Our study provides an example for those interested in adopting standard methods but may be hesitant due to the existence of long-term, historic datasets.

Watershed-Scale Differences in Brook Trout and Brown Trout Population Connectivity: Insights from Culvert Assessments

Mark Kirk[1]

Trout exhibit complex life cycles, which require moving between different habitats along the longitudinal stream gradient and at different life stages. As a result, the loss of population connectivity from anthropogenic barriers is one of the biggest threats acknowledged for trout conservation. However, managing and restoring aquatic organism passage (AOP) for native trout often requires consideration of non-native trout, especially if the non-native poses a risk of invasion. The objective of our study was to determine how population connectivity differed in allopatric native Brook Trout watersheds (n = 6; *Salvelinus fontinalis*), allopatric non-native Brown Trout watersheds (n = 6; *Salmo trutta*), and sympatric watersheds with both species (n = 3). Population connectivity was assessed based on intensive electrofishing surveys over the years and AOP was quantified by performing culvert assessments following the North American Aquatic Connectivity Collaborative (NAACC). Brook Trout watersheds were smaller in area than Brown Trout watersheds. As a result, Brook Trout watersheds had lower levels of population connectivity due to a higher number of culverts, whereas Brown Trout watersheds had a higher number of bridges. While the spatial constraints of Brook Trout within a watershed were largely dictated by the presence of poor crossing structures, the upstream extent of non-native Brown Trout was related to both changing land use and poor crossing structures. Restoring AOP for native trout remains one of the most important conservation strategies, but other important considerations need to be made as well (e.g., invasion potential of non-native trout, quality of habitat). Our results reveal the unsettling truth regarding how benefits to native trout AOP will likely also allow for non-native trout invasions.

Impacts of Non-Native Trout and Stocked Trout Fishing on Wild Brook Trout Populations in West Virginia Streams

Xander Lamping[41], Kyle Hartman[41], David Thorne[40]

In a number of West Virginia streams hatchery trout are stocked on top of wild Brook Trout populations. This raises concerns that hatchery fish may be negatively affecting Brook Trout, or that stocked trout anglers may be impacting wild Brook Trout through harvest in such areas. To identify harvest of wild Brook Trout, creel surveys were performed from January to May on four West Virginia streams that are stocked with trout and that are also known to have wild Brook Trout populations. We used a model incorporating scale morphology and fin condition on known hatchery and wild Brook Trout to allow us to differentiate between wild and stocked Brook Trout in the creel. We evaluated non-native trout influence on Brook Trout population metrics using a linear mixed effects model incorporating data from two long term Brook Trout monitoring studies in West Virginia. These datasets have both streams with only Brook Trout and others that have Brook Trout and non-native trout species. Models were run to look at influences on total biomass, average length, abundance of YOY, and total abundance of Brook Trout using presence/absence of non-native trout and stream wetted width as fixed effects. Stream and year were used as random effects to control for spatial and temporal variability. The creel study found very low levels of wild Brook Trout harvest by stocked trout anglers. Limited harvest was documented and this rate varied by stream. The results of the mixed effect model showed abundance of Brook Trout was positively correlated with presence of non-native trout and this was the only response variable that was found to be statistically significant.

Projecting the Distribution of Aquatic Species of Greatest Conservation Need throughout the Mid-Atlantic Region

Alexandra Lawrence[41], Brent Murry[41], Caroline Arantes[41], Patricia Mazik[33], Christopher Rota[41]

Worldwide, freshwater species are in decline. There are numerous multivariate pressures behind this decline with which conservation managers must contend. Yet managing for sustainable biodiversity conservation in freshwater ecosystems is further complicated in the context of uncertainty caused by global change. Quantifying the effects of environmental change on the occurrence and distribution of aquatic species is critical to ensure that populations survive and that management actions remain effective into the future. In this study, we investigate Wild Brook Trout and Smallmouth Bass distributions in the Susquehanna River Basin. Both species are important for recreation. Wild Brook Trout is a cold-water adapted predator and listed as Species of Greatest Conservation Need (SGCN) throughout the mid-Atlantic. Smallmouth Bass is a cool/warm-water adapted predator. This raised the question if habitat in the mid-Atlantic in the future is likely becoming less favorable for Brook Trout and more suitable for supporting Smallmouth Bass populations instead. While Wild Brook Trout inhabit small streams of cold-water temperatures, climate change is projected to lead to warming of streams which makes large sections of PA nearly unsuitable for Brook Trout according to our preliminary results. Contrary, our models predict Smallmouth Bass expanding occurrence range in the future, as large sections of the Susquehanna River Basin are predicted to warm and become more suitable for this species. By approaching this study in co-production with conservation practitioners and local stakeholders in the region, our results can be integrated into long-term conservation decision-making. Quantitative tools like these can help characterize species shifts due to global change so that ecological information can be integrated more quickly and efficiently into climate-smart conservation practices and policy decisions. As such, our multi-state, multi-institutional approach to data-informed conservation planning can serve as a model for other transregional studies in the future.

If at First You Don't Succeed: The Evolution of Capture Methods in Great Lakes Grass Carp *Ctenopharyngodon idella* Control

Robert Mapes[36], Christine Mayer[36], Robert Hunter[36], Ryan Young[32], Ryan Brown[36], Eric Weimer[20]

Grass carp (*Ctenopharyngodon idella*) control efforts in the Great Lakes follow an adaptive management framework to continually improve removal efficiency. Initial planned action events suggested a combination of trammel nets and electrofishing (combination method) that herded fish was the most effective method. However, these initial attempts had low catches and were focused in locations that have low grass carp densities. Following substantial project expansion and increased effort in areas with higher densities of grass carp, field crews began to experiment with other methods. A second post-hoc method comparison found electrofishing without the trammel nets to be >3 times more efficient than the combination method. The project adapted and began focusing on electrofishing while continuing to explore ways to improve efficiency through improvements to our electrofishing protocol and experimenting with other capture methods. Field crews tested passive overnight gill net sets and were very successful, catching more grass carp in one night than the previous month of electrofishing. Gill net use has expanded through the project and contributed to more grass carp being captured during 2024 than in any other year since control efforts began in 2018. A multi-disciplinary team allows for data to be analyzed without needing to pull people out of the field. Designing a project to capture novel species with limited information is challenging and therefore an adaptive approach that is able to analyze data as it is being collected is vital to invasive species control. Although it has resulted in increased captures, changing methods creates challenges for abundance models. The adaptive management framework allows for this large, multidisciplinary project to quickly leverage data as it is collected and make changes in the field in real time; which is invaluable to stopping the spread of invasive carp while they are still relatively rare in the system.

Demographic Variation between Maumee and Sandusky River Grass Carp

Justin Meyer[36], Christine Mayer[36], Robert Mapes[36], Ryan Brown[36], Robert Hunter[36], Jesse McCarter[32]

Invasive Grass Carp (*Ctenopharyngodon idella*) are large, fast-growing, herbivorous fish that inhabit nearshore Lake Erie and tributaries and pose a significant threat to wetlands and nearshore vegetation. Concurrent increases of incidental Lake Erie Grass Carp captures and regional concern over invasive carp in the Great Lakes watershed resulted in the formation of a large, multijurisdictional Grass Carp removal program. Since 2020, many Lake Erie tributaries have experienced high fishing effort, with the Maumee and Sandusky rivers being a management focus due to elevated catch rates and observed spawning behavior annually evidenced by egg and larval collections. Skewed sex ratios or declining proportions of triploids in harvested Grass Carp may indicate localized impacts of removal and can help inform more effective future management actions. We evaluated spatial trends in Grass Carp sex and ploidy and observed differences between the two rivers. Maumee River Grass Carp were captured in four collection areas based on boat ramp availability and local hydrology. Maumee River Grass Carp were ~40% diploid, with lower diploid:triploid ratios occurring in collection areas farther upstream. Sandusky River Grass Carp were ~80 % diploid, with proportionally fewer female captures upstream. Sandusky River diploid ratios were higher than all other tributaries where Grass Carp were regularly captured (~40% diploid or less). Finally, among diploid Grass Carp captured during spawning response efforts, there was a male bias in the Maumee River (28/30 captures), but not in the Sandusky River (26/51 captures). Accordingly, current spawning response practices in the Maumee may not target areas where diploids, especially female diploids, aggregate. Maumee and Sandusky River Grass Carp demographics appear to be spatially heterogeneous, and current removal methods and limited access to areas with high concentrations of diploids may hamper the removal of fish that likely contribute the most to natural Lake Erie recruitment.

Identifying Broad-Scale Drivers of Riverine Fish Occurrence in their Native and Non-Native Range

Andrew Miller[22], Charles Yackulic[33], Drew Eppehimer, Lindsey Bruckerhoff[31]

Understanding the drivers of non-native species distributions is a first step in the management of their populations but is challenging if environmental drivers vary between the native and introduced range. Historical distributions, habitat alteration, and past stocking practices influence the present-day occurrence patterns of a widespread game fish, Smallmouth Bass, in lotic habitats across the United States. The goal of our study was to identify broad-scale drivers of occurrence of riverine Smallmouth Bass and determine whether these influences vary between the native and non-native ranges. We used occurrence data at the stream-segment level and habitat predictors describing aspects of water temperature, streamflow, agricultural land use, soil erodibility, and reservoir influence. We developed a set of candidate binomial generalized linear mixed models to explore these relationships and their potential interactions with the species range (i.e., native vs. non-native). Model selection supported the inclusion of several environmental predictors, each of which interacted with range (native vs. non-native). Occurrence probability increases at intermediate summer water temperatures and with decreasing proportion of annual flow volumes occurring in the spring, with these and other relationships more pronounced in the native range. Greater uncertainty in predicted occurrence probability in the native range may reflect more frequent stochastic occurrences due to species prevalence or greater plasticity of these populations compared to non-native populations. The identification of broad-scale conditions that influence Smallmouth Bass occurrence will be useful to practitioners seeking to manage these populations across a range of environmental gradients and identify stream reaches vulnerable to invasion in the introduced range.

Artificial Incubation of *Creaserinus fodiens*: A Step Toward Conserving Imperiled Burrowing Crayfish

James Hartley[10], **Alyssa Oppedisano[10]**

Creaserinus fodiens (Cottle 1863), commonly known as the Digger Crayfish, is a primary burrowing species that inhabits complex burrows in wetlands, seasonal pools, wooded floodplains, and roadside ditches. Historically, *C. fodiens* ranges from its type locality in Ontario, Canada, to Texas, and spans across four Atlantic slope states: Virginia, Maryland, North Carolina, and South Carolina. While having a broad distribution, the conservation status varies from state to state. In Virginia, *C. fodiens* has been classified as a vulnerable species due to high levels of habitat degradation. Populations in West Virginia and Pennsylvania are critically imperiled, and other states, including Alabama and Indiana, also report vulnerable populations. While there is growing concern for the species, there is a notable lack of conservation efforts aimed at supporting these populations. This study investigates ex-situ rearing and artificial incubation of *C. fodiens* eggs collected from Virginia. The eggs were carefully extracted from the mother, counted, and placed into mesocosms within clear PVC pipes, where they rested on mesh netting. The system was aerated to create an up-flow of water, which oxygenated the eggs and reduced bacterial growth through a gentle tumbling motion, mimicking the natural care provided by the mother's pleopods. Weekly assessments of survival and growth rates were conducted, resulting in a 90% hatch rate and an 89% survival rate after two weeks, indicating the effectiveness of the artificial incubation method. Upon completion, this rearing methodology will provide an effective approach to successfully rear burrowing crayfish through artificial incubation, offering a valuable tool for the conservation and management of threatened crayfish species. *Creaserinus fodiens* will ultimately serve as a surrogate species for future conservation efforts aimed at preserving other imperiled burrowing species.

Evaluating Ohio's Length-Based Harvest Regulations: What's Worked and What Hasn't

Jeremy Pritt[20], Stephen Tyszko[20], Joseph Conroy[20], Kevin Page[20], Taylor Hunkins[20], Richard Zweifel[20]

Since the 1980s, fisheries management agencies have increasingly implemented length-based harvest regulations (minimum length limits, slot limits, etc.) to reduce growth overfishing and improve size structure of sport fish populations. However, the literature lacks robust evaluations of length-based regulations, making it difficult to generalize their effectiveness. Here, we synthesize recent evaluations of length-based regulations applied to *Pomoxis* spp., *Sander* spp., and *Micropterus* spp. populations in Ohio reservoirs that leverage long-term, statewide standard fish assessment and creel survey data. We found that minimum length limits on *Pomoxis* spp. populations had a desired effect of increasing the abundance of large fish in large, productive reservoirs, but were counterproductive in small, unproductive reservoirs, leading to increased abundance and decreased growth. Despite receiving strong support among anglers, minimum length limits had minimal effects in structuring *Sander* spp. populations, but led to decreases in angler yield. A variety of minimum length and slot limits had no discernable effects on *Micropterus* spp. population characteristics or creel survey metrics. Length-based regulations have not been universally successful at achieving fisheries objectives in Ohio. Based on a decade of work examining length-based regulations, we recommend best practices for applying and evaluating regulations. For applying regulations, we suggest that fisheries managers set quantifiable objectives, carefully document a plan for determining success or failure, and seek strong experimental designs. For regulation evaluations, we recommend leveraging standard data, publishing findings in peer-reviewed literature, and developing strategies for communicating with stakeholders. Lessons learned from our experiences evaluating harvest regulations can inform harvest management in Ohio and beyond.

Development of a Central Ohio Fish and Macroinvertebrate-Based Integrated Priority System (IPS) for Deriving Stressor Thresholds for Streams and Rivers of Central Ohio

Edward Rankin[14], Chris Yoder[14], Edward Hicks[14], Vickie Gordon[14], Stuart Johnson[14]

The Clean Water Act (CWA) has a key goal to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters." Ohio used fish and macroinvertebrate data in streams and rivers to derive biological criteria goals for tiered aquatic life uses that range from Exceptional Warmwater Habitat (EWH) streams to modified and limited resource (highly modified) waters. Ohio also has "antidegradation" tiers (e.g., Outstanding State Resource Waters) that are designed to protect water resource quality that may exceed the baseline aquatic life. The Central Ohio study area is focused on the Scioto and Muskingum River watersheds in the Eastern Corn Belt and Erie Ontario Lake Plain aquatic ecoregions, parts of which are undergoing rapid development. Biological response data includes fish and macroinvertebrate (including mussels) data from the late 1970s to 2024 to be paired to available stressor data. Stressor thresholds will be developed for a wide variety of parameters including stream habitat (QHEI and metrics), water column and sediment chemistry (demand, ionic strength, metals, organic compounds). Thresholds will also be derived for land use coverages (e.g., % urban, % impervious) in the entire watershed, in local watersheds and fixed (30m) and variable width buffers (e.g., 50-year floodplain). Weighted stressor values will be used to classify stressor sensitive species/taxa for each stressor and related to the biological assemblage indices (IBI, ICI) to derive thresholds for each parameter. Goodness-of-fit and random forest regression and classification analyses will be used to rank the importance of each stressor. All thresholds and stressors will be placed on a 0-10 scale and made accessible in Power BI reports. MBI will derive Restorability, Susceptibility and Threat indices with a goal of informing choice of restoration BMPs focused on treating limiting stressors and identifying high quality and threatened waters in Central Ohio watersheds.

Potential Effects of Shale Gas Development on Fish and Benthic Macroinvertebrate Communities in Stream of Northcentral Pennsylvania

Bridget Reheard[25], Paola Ferreri[25], Samuel Shaheen[25, 43], Susan Brantley[25]

Hydraulic fracturing of the Marcellus Shale Formation has sparked controversy over its potential environmental impacts. Concern has risen over potential releases of saline produced water, or brine, into small streams via wellpad spills or poorly constructed impoundments. This study evaluates the feasibility of characterizing the effects of brine inputs on the water chemistry and biota of small streams. We selected 12 second-order streams in the Tiadaghton and Sproul State Forests of northcentral Pennsylvania where shale gas development is highly concentrated. The streams were selected along a gradient of reported spill and impoundment violations, where sites with no violations or drilling were used as reference conditions. Water samples and benthic macroinvertebrate communities (BMI) were collected in fall 2024. Using strontium isotope ratios (87Sr/86Sr) as a fingerprint for brine contamination, only one site, Browns Run, returned a chemical profile indicative of brine. BMI samples were identified to family level and NMDS was used to visualize differences in community structure by site. BMI communities in most Sproul and Tiadaghton sites cluster closely, but Browns Run differed noticeably, containing a more pollution tolerant BMI community as well as a greater presence of Leuctridae, a stonefly family with growing support in literature for heightened osmotic tolerance. To evaluate potential effects on fish communities, we sampled fish using single pass electrofishing in Browns Run and in the nearest reference site, Trout Run. Trout Run had slimy sculpins, Brown Trout, and Brook Trout while Browns Run had Brook Trout only. Analysis of the length-weight relationship showed that Brook Trout in Browns Run (b=2.70) were in poorer condition than Brook Trout in Trout Run (b=3.03). The case study of Browns Run provides evidence that biotic communities in smaller streams may respond to brine contamination in measurable ways, indicating that future monitoring efforts may be needed.

Age and Growth of Flathead Catfish *Plyodictis olivaris* in the Upper Ohio River

Macey Rowan[40], Katherine Zipfel[40]

The Ohio River, a major tributary of the Mississippi River, provides popular commercial and recreational fisheries throughout its basin. Flathead catfish (*Pylodictis olivaris*) are a large, long-lived sportfish providing a popular trophy-oriented fishery throughout the length of the river. Due to the interjurisdictional nature of the Ohio River, many sportfish species are managed concurrently, in cooperation with other states in an effort to simplify harvest regulations. In coordination with an ongoing river-wide population assessment of P. olivaris by the Ohio River Fisheries Management Team (ORFMT), West Virginia Division of Natural Resources (WVDNR) evaluated growth, age structure and mortality within the Hannibal, Willow Island, Belleville, and Racine pools of the Ohio River (RM 84- RM 237). Sampling was conducted in 2022-2023 employing low-frequency electrofishing (DC output ~200V, 2 amps, 15 pulses/sec) throughout each pool. Lapilli otoliths from over 800 individuals across all pools were collected for age and growth analyses. Growth, age structure and mortality estimates will be evaluated for each pool and then compared between pools. Preliminary results suggest that while abundance, growth and mortality estimates may differ between pools, there seems to be no consistent correlation with river mile observed. Total mortality was similar across all pools at about 0.15, with very little fishing mortality estimated. This data will also be compared to an earlier assessment of P. olivaris conducted by WVDNR in 2010, which lead to the establishment of our current harvest regulation of four fish daily creel, one over 35”. Potential changes in population structure will be evaluated. Further statistical analyses are ongoing.

New Species of *Petrotilapia* (Teleostei: Cichlidae) from Mumbo Island in Lake, Malawi, Africa

Sara Sabo[25], Jay Stauffer[25]

The rock-dwelling cichlids from Lake Malawi, known as mbuna, comprise a diverse group of haplochromine fishes that are placed among 14 genera. Within *Petrotilapia*, there are three species groups: *P. tridentiger* group, the P. nigra group and the *P. genalutea* group. A new species of *Petrotilapia* in the *P. nigra* group from Mumbo Island, Lake Malawi is described herein. Currently the two known species of *Petrotilapia* from Mumbo Island are *Petrotilapia nigra* and *Petrotilapia mumboensis*. Males are yellow with brown or tan vertical bars, a yellow cheek, and yellow gular region, which distinguishes it from *P. nigra*, and *P. mumboensis*. Males of *P. nigra* are blue-black, have a dark blue cheek, and black throat, while males of *P. mumboensis* are bright blue and have a light blue throat. Females are pale yellow with a gray head and conspicous submarginal band in the dorsal fin which distinguishing it from females of *P. nigra*, as well as a gray anal fin with differs from the brown anal fin of *P. mumboensis*.

Modeling Factors Impeding the Spread of Invasive Carp in the Ohio River

Erin Shepta[41], Brent Murry[41], Caroline Arantes[41], Christopher Rota[41], Laura Gigliotti[33]

Invasive carp (*Hypophthalmichthys spp*.) have rapidly invaded most of the upper Mississippi River basin, however, within the Ohio River basin their spread has progressed much slower or stalled completely in some locations. The rate of spread of an invasive species is known to be influenced by that species' ability to successfully disperse (i.e., colonize) and establish new populations (i.e., persist) within an invaded ecosystem. Here we aim to assess factors hindering invasive carp the dispersal and establishment success over space and time. To do this, we used occurrence data of adult Silver (H. molitrix) and Bighead (H. nobilis) collected from 2015-2024 across sites in both the main channel and tributaries of the Ohio River. Detection/non-detection data of carp were used as a response variable in a dynamic multi-scale occupancy model to investigate trends in carp establishment success across multiple temporal and spatial scales. This novel technique seeks to extend multi-scale occupancy models to account for dynamic processes at large spatiotemporal scales (pools occupancy across years), as well as local-scale (site-level) dynamics across multiple temporal scales (annually and intra-annually). Here, large-scale dynamic trends highlight larger-scale spread dynamics of invasive carp, indicating yearly changes to environmental conditions such as extreme flow events that may influence carp's ability to disperse and colonize upstream reaches. Smaller-scale dynamic trends are more indicative of factors influencing carp establishment success. These include potential lack of suitable nursery habitat (i.e., backwaters, floodplain lakes, wetlands) or unfavorable spawning conditions that could be preventing invasive carp from successfully establishing new populations. Results from this study could provide valuable insight into environmental factors limiting the dispersal and establishment of carp across multiple scales, ultimately assisting managers on identifying both basin-wide and reach-level efforts that could help stop the spread of invasive carp in the future.

Environmental Factors Influencing Hellgrammite Populations (*Corydalis cornutus*) within Riffles in Central Ohio Rivers

Rocky Smiley[38], Jon Bossley[15]

Hellgrammites, larval *Corydalis cornutus*, are sensitive aquatic macroinvertebrates that may be undergoing population declines in Ohio rivers. These large predaceous macroinvertebrates are known to prefer riffle habitats in lotic ecosystems. However, no information is available on the microhabitat use of hellgrammites within riffles and how their populations differ spatially and temporally. Our research questions were: 1) What is the influence of abiotic and biotic factors on hellgrammite population characteristics within riffles in four central Ohio rivers? and 2) Do hellgrammite population characteristics differ among rivers and years? We collected hellgrammites and measured hydrological, substrate, large instream wood, and canopy cover variables in nine riffles in 2023 and 10 riffles in 2024. We captured 276 hellgrammites ranging in size from 11 to 90 mm body length. Preliminary mixed effects model analyses indicated that: 1) hellgrammite occurrence and density were positively correlated (P 0.389) with any of the independent variables. Mixed effects model analyses also indicated hellgrammite occurrence and density were greater (P 0.05) among streams, but in 2024 head capsule width was greater (P < 0 .001) in Kokosing and Clearfork River riffles than Alum and Upper Big Walnut Creek riffles. Our results highlight that within riffles of central Ohio rivers water velocity, percent boulders and cobble, and within-riffle spatial position are influential determinants of hellgrammite populations and that these populations differ spatially among rivers.

Spatial and Trophic Assessment of Microplastic Concentrations across Biota in Lake Erie

Bailee Guernsey[31], Keith Andringa[30], **Zachary Steffensmeier[31]**

Microplastic pollution has been found in bodies of water across the planet including the largest surface freshwater reservoir, the Great Lakes, putting the organisms that inhabit them at risk. The way in which microplastics travel across trophic levels and accumulate in Lake Erie species remains largely unknown, emphasizing the need for comprehensive research in this ecosystem. The purpose of this study was to test the hypotheses that 1) organisms are bioaccumulating microplastics up trophic levels; 2) closer proximity to more urbanized areas will result in increased levels of microplastics in biota; and 3) larger organisms of the same species will contain an increased number of microplastics. Microplastic concentrations were examined in Dreissenid mussels, Round Goby (Neogobius melanostomus), Freshwater Drum (Aplodinotus grunniens), and Smallmouth Bass (Micropterus dolomieu). Samples were collected at sites in open water Lake Erie and near urbanized areas such as Cleveland and Toledo. Microplastics were isolated from samples via digestion with 10% KOH. The characteristics and number of microplastics were identified using a dissecting microscope. The presence of microplastics was confirmed by using a flame-heated needle and observing melting or shape change. Our findings indicate that top predators do not contain higher microplastic concentrations in comparison to basal sources. Furthermore, our findings indicate that microplastic concentrations in our study species are not impacted by the degree of urbanization or organism size. Nevertheless, microplastics remain a threat to aquatic species and the accumulation of microplastics in Lake Erie species should continue to be studied to further assess their impacts.

A Novel Conservation Approach: An Introduction to the Rapid Stream Delisting Strategy

Logan Stenger[4]

No stream wants to be on the federal Clean Water Act's impaired waters list. Thus, the Chesapeake Conservancy and its restoration partners conceived the "30 x 30" Stream Restoration Strategy in 2019, now referred to as Rapid Stream Delisting. This strategy aims to restore agriculturally-impaired streams by accelerating the implementation of best management practices (BMPs) to improve stream habitat and water quality. The ultimate goal is to remove, or "delist", 30 agriculturally-impaired streams from the federal impaired streams list by 2030. To trigger stream reassessments, our staff and partners conduct detailed water quality assessments to establish baseline conditions and track changes over time in our priority watersheds. Water quality data includes water chemistry, physical habitat, and benthic macroinvertebrates. In 2024, the Central Pennsylvania Delisting Partnership celebrated an exciting milestone - the successful delisting of approximately 5 miles of impaired streams from three different watersheds! While extensive restoration work is needed to achieve our 30 x 30 goal, these early successes demonstrate the potential of this strategy - not only for advancing water quality improvements in Pennsylvania's portion of the Chesapeake Bay watershed, but also as a model for broader watershed restoration efforts across the region.

Microplastics in the Mountains: A Freshwater Study on Appalachian Stream Pollution via the Northern Hogsucker

Isabella Tuzzio[41], Brent Murry[41], Caroline Arantes[41]

Microplastic pollution levels and potential sources of contamination in North Central Appalachia are evaluated through the identification of particles in the *Northern Hogsucker* fish. fifty-five fish were sampled from 9 sites throughout 7 freshwater streams in the region. Microplastic particles were extracted from the gastrointestinal (GI) tracts via 10% KOH digestion and identified visually. A total of 2,185 particles were identified, ranging between 8 and 274 particles/individual and an average of 39.73 particles/individual. The most particles were found in fish within the Cheat watershed, particularly at the Big Sandy Creek downstream site, followed by tributaries of the Monongahela and Ohio Rivers. The most identified particle type was fiber (96.61%). There was a positive relationship between fish total length and number of particles. Agricultural land use and E. coli abundance were positively correlated with microplastic abundance. Agricultural land use and sewage input appear to be important drivers of microplastic pollution in these streams, although we cannot rule out the influence of atmospheric deposition. These results point to widespread levels of microplastic contamination in freshwater ecosystems in North Central Appalachia.

A Journey with the Becoming an Outdoors Woman (BOW) Program in West Virginia

MacKenzie Ullman[32], Emily McCabe[40]

This presentation explores a journey with the Becoming an Outdoors Woman (BOW) program in West Virginia. The origins, current status, and potential growth of the program are reviewed. Additionally, an instructor's personal account of experiences and skills imparted to the BOW community is shared. It highlights the diverse range of courses offered, from hiking and fly fishing to archery and camping, showcasing how these experiences empower women to embrace the outdoors. Finally, the presentation examines the broader impact of West Virginia BOW on participants, illustrating how it fosters confidence, camaraderie, and a deep connection with nature.

Lower Great Lakes Fish and Wildlife Conservation Office: Ohio River Substation Telemetry Array Program

Brennon Watt[32]

As an active member of the Ohio River Basin Partnership Telemetry Program targeting invasive bigheaded carp (Silver Carp (*Hypophthalmichthys molitrix*) and Bighead Carp (*H. nobilis*)), the Lower Great Lakes Fish and Wildlife Conservation Office: Ohio River Substation focuses on monitoring, tracking, and expanding the telemetry array in and above the invasion front (R.C. Byrd Lock and Dam facility (RM 279) to the Willow Island Lock and Dam facility (RM 162)). The array covers four pools (R.C. Byrd, Racine, Belleville, Willow Island) within the Ohio River Basin, and consists of 27 receivers (18 mainstem, 9 tributary), with an additional 11 receivers (10 mainstem, 1 tributary) deployed and maintained by West Virginia Division of Natural Resources. Current plans are to deploy approximately 20 additional receivers to increase coverage in selected mainstem and tributary locations. Detections collected from this array will be evaluated to establish potential correlations with invasive carp movement and environmental river conditions (e.g., temperature, flow).

The Influence of Fishing Gear on Yellow Perch Catch Success in Western Lake Erie

Kylee Wilson[31], Olivia Houpt[2], Stuart Ludsin[31]

Globally, recreational angling is culturally, ecologically, and economically important. In Lake Erie, recreational angling is a keystone activity with a strong emphasis on sportfish such as Walleye (*Sander vitreus*), Smallmouth Bass (*Micropterus dolomieu*), and Yellow Perch (*Perca flavescens*). While harvestable adult Yellow Perch are abundant in the Lake Erie's western basin, successful landings have varied historically with a particularly noticeable decline starting in 2016. Several potential reasons exist for the observed decline in catch success such as increased consumption of the invasive spiney water flea (*Bythotrephes longimanus*), which could put angler lures at a competitive disadvantage by leading to a reduction in fishing success when invertebrate abundances are high. Additionally, an increase in predatory fish such as Walleye may lead to Yellow Perch using a different part of the water column or favoring sub-optimal habitat that offers refuge from increased predation pressures. Anglers traditionally fish for Yellow Perch along the bottom but given the possibility that Walleye may have caused a shift in habitat use, there is a chance that anglers are less successful because they are fishing in the wrong section of the water column. Given the uncertainty underlying the observed decrease in catch success, we designed a "natural" fishing experiment that aimed to determine which environmental conditions, gear types (spreader, crappie rig, and Sabiki rig), and hook depths yielded the highest success rates when fishing for Yellow Perch. Preliminary results indicate that catch per unit effort (CPUE) varied among gear types, and overall, CPUE's associated with the Sabiki gear were lower compared to the other gear types (one-way ANOVA, Tukey HSD, $P < 0.05$). As we continue to include more factors such as Bythotrephes densities and environmental factors, we strive to gain a stronger explination towards understanding the recent decline in Yellow Perch angling success in western Lake Erie.

Don’t Overlook the Macrophytes, Especially Horn Leaf Riverweed (*Podostemum ceratophyllum*)

James Wood[39]

Macrophytes (aquatic plants) are important components of aquatic ecosystems but are often overlooked by freshwater ecologists. This is especially true in lotic systems where aquatic plants can look similar and be difficult to identify. Throughout the Appalachian region, the aquatic plant *Podostemum ceratophyllum* grows attached to submerged stable substrates in swiftwater habitats. The plant provides an important habitat for aquatic insects and fishes, but these relationships need additional attention, especially by fisheries biologists. Here, we discuss some of the basic ecology of the plant and review some of the ways the plant supports macroinvertebrate communities and stream fishes.

The Fate of Nutrients in Acid Mine Affected Tioga watershed

Graham Zechman[7], Gregory Moyer[7], Steven Rier[6], Gregory Carson[7]

Legacy pollutants from acid mine drainage (AMD) in the Tioga River have been sequestering nutrients, preventing harmful algal blooms (HABs) and preventing excess nutrient concentrations from flowing down to the Chesapeake Bay. However, the upcoming AMD remediation in 2026 may disrupt this nutrient retention process, potentially leading to increased HABs in downstream ecosystems. This study assessed the fate of these legacy pollutants (i.e., nutrients like phosphorus and heavy metals like aluminum and iron) entering Tioga Reservoir through comparison with non-AMD impacted Hammond Reservoir. We monitored water quality, by quantifying mean orthophosphate, total phosphorus, total aluminum, and total iron, as well as pH, conductivity, temperature, and dissolved oxygen from water and sediment samples. Results indicate that there is no significant difference in nutrients or metals entering Tioga Reservoir vs Hammond Reservoir during normal, high-water, and drought conditions. Phosphorus appears to be bound to precipitated metals in the Tioga River, as evidenced by the minimal phosphorus concentrations detected. Additionally, our results indicate that there is no significant difference in the nutrients and metal concentrations entering Tioga Reservoir from the Tioga River compared to those leaving the reservoir, suggesting that the Tioga Reservoir functions as a sink under each condition. Total phosphorus concentrations were significantly higher in Hammond Reservoir sediment compared to Tioga, while no significant differences were found in metal concentrations. Thermal stratification in the reservoir was observed, but it was disrupted by high-water events, limiting the opportunity to study biogeochemical cycling during turnover. Our results highlight the need for studying biogeochemical cycling of aquatic ecosystems impacted by AMD, particularly in light of AMD remediation efforts, to ensure compliance with nutrient reduction goals in the Chesapeake Bay watershed. This study provides critical data for understanding legacy pollutant dynamics in AMD-impacted systems and informs future watershed management frameworks under the Clean Water Act.

Poster Presentations

Assessing Habitat Suitability in the Maumee and Sandusky Rivers for Sauger *Sander canadensis* Reintroduction

Elizabeth Anderson[36], Jonathan Bossenbroek[36], Christine Mayer[36], Jeremy Pritt[20], Brian Schmidt[20]

Sauger (*Sander canadensis*) were once a native sport fish in western Lake Erie, but have been extirpated from the lake since the mid 1960s due to habitat fragmentation, poor water quality, and fishery exploitation. With improvements in Lake Erie water quality and fisheries in recent decades, the Ohio DNR-Division of Wildlife is considering sauger reintroduction into western basin tributaries. While current lake conditions may be able to support a new population of sauger, the extent of habitat fragmentation and availability of suitable spawning habitat in tributaries remain unknown and are important to determine prior to reintroduction. Therefore, the goal of this study is to assess the quality, quantity, and connectivity of available sauger spawning habitat in the Maumee (mouth to rkm 51) and Sandusky (mouth to rkm 38) rivers, the historic spawning tributaries of the western Lake Erie population. Spawning habitat quality and quantity were assessed using Habitat Suitability Index (HSI) models which were created using river substrate, velocity, and depth as habitat components. HSI modeling showed that 50.8% (169.2 ha) of available habitat in the Sandusky River is suitable for spawning under mean spawning season flows (2,000 cfs), and 49.5% (890.2 ha) of available habitat in the Maumee River is suitable for spawning under mean spawning season flows (10,000 cfs). The connectivity between patches of suitable spawning habitat will be assessed using the flow modeling software, HEC-RAS, to model river velocity and depth for a range of flow conditions from the minimum to the maximum during the sauger spawning season. Potential velocity barrier locations and conditions will be identified by comparing HEC-RAS velocity output to sauger velocity tolerances found in literature. The preliminary results of the HSIs suggest that the amount of available spawning habitat is promising in supporting reintroduction efforts.

Fish Use of Artificial Habitat

David Argent[26]

The US Army Corps of Engineers (USACE) initiated removal of the Elizabeth Lock and Dam from the Monongahela River in July 2024. To mitigate for the loss of artificial habitat (tailrace) created by the dam, they installed 73 artificial reef structures. During the summer and fall, we assessed a select number of reef and adjacent non-reef sites to determine their use by fish. In addition, we fished reef and non-reef sites to determine their ability to attract game fishes. Using a Remotely Operated Vehicle (ROV), we captured video of each reef and non-reef habitat and quantified fish species (by species and abundance). As summer progressed, many reefs were occluded with vegetation, making video capture difficult. In addition, the USACE kept the pool created Elizabeth L/D very low, making it impossible to launch a boat. Therefore, we used canoes and kayaks to reach our sites. We identified Smallmouth Bass (*Micropterus dolomieu*) as the dominant species using the reef along with schools of minnows (likely Emerald Shiners (*Notropis atherinoides*)). Fishing further confirmed reef use by game fishes when compared to non-reef sites. This novel sampling technique rarely used in freshwater environments offers great promise as a surveillance tool for lake or river monitoring.

The Fishes of Select Presque Isle

David Argent[26]

Presque Isle is a dynamic system, with shifting beaches which has created a series of sand pits along is eastern-most edge. We sampled four of these pits located between Gull Point and Beach 10, between 24-25 June 2024. We employed backpack-electrofishing gear and Wisconsin-style-mini-fyke nets to sample fishes. Approximately 30 minutes was expended in each pond with electrofishing gear while fyke-nets were left to fish overnight. We collected 45 fishes with electrofishing gear and 350 fishes with fyke nets. The Central Mudminnow (*Umbra limi*) was the dominant fish collected with electrofishing gear (22% of catch), while Common Shiner (*Notemigonus crysoleucas*) was dominant with fyke net (84% of catch). Each pond contained relatively unique communities of fishes. Of note was the capture of Warmouth (*Lepomis gulosis*), a state endangered fish. Continued sampling could reveal other fishes present in these ponds.

A Comparative Study of Stream Health and Macroinvertebrate Communities in Urbanized Tributary Streams

Reagan Bally[39], James Wood[39]

Urbanization in watersheds is known to alter water chemistry and hydrology, which can subsequently impact macroinvertebrate communities. Additionally, sedimentation, often linked to human activities such as agriculture and construction, can further exacerbate these effects. In this study, we compared the macroinvertebrate communities of two small stream systems that differ in urbanization levels. The first site, Castleman's Run, is a forested stream and a third-order tributary of Buffalo Creek, while the second site, Long Run, is located in a highly urbanized area and is a second-order tributary of Wheeling Creek. Using multi-year water chemistry data and macroinvertebrate sampling, we evaluated trends in water quality and examined differences in macroinvertebrate communities between the two sites. We also provided an overall assessment of stream health for both Castleman's Run and Long Run. Macroinvertebrate samples were then identified to the family level, which allowed us to assess group-specific tolerance values and better understand their relationship to ecosystem quality.

Impact of Unconventional Gas Extraction on Tributaries of Tenmile Creek, Green County, Pennsylvania: A 12-year Perspective

Luke Beall[9]

Tenmile Creek is a tributary of the Monongahela River with a drainage area of roughly 1400 square miles. Like much of southwestern Pennsylvania in the past two decades, it has been central to a rapid increase in development for unconventional natural gas extraction. With environmental analyses outpaced by the rapidly expanding industry, the continued monitoring of streams such as Tenmile over their lifetime as extraction sites is pivotal to understanding the effects of fracking on local waterways and their ability to provide for wildlife and human use. Here, using multiple indices of biotic integrity (IBI), we perform analyses of fish and macroinvertebrate communities as well as water chemistry on a pair of tributaries, Bates Fork and Fonner Run, as part of a follow-up to work performed there from 2010-2012. Fish surveys revealed communities consistent throughout the study period but with a baseline that varied heavily by IBI used, with a local IBI finding low water quality across the study period. Macroinvertebrate surveys found communities with minor levels of impairment inconsistent with damage from fracking specifically. Chemical analyses found only a few exceedances, with Bates Fork having iron and manganese levels above the maximum contaminant limit, though severe impacts from fracking or mine drainage seem unlikely at this time. Overall, this study provides a continuing baseline for further monitoring of the watershed, while highlighting the issue of inconsistency between local and regional indices of biotic integrity.

An Examination of Temporal Variation in Food Web Dynamics of Fish Assemblages in the Lower Amazon Using Stable Isotopes

Megan Beeksma[41], Caroline Arantes[41]

The Amazon River floodplain is a temporally heterogeneous and dynamic ecosystem due to remarkable seasonal flood pulses. However, there is a lack of empirical evidence demonstrating ecological dynamics across landscapes in this ecosystem. This study utilizes stable isotopes to assess variations in food web dynamics associated with the seasonal flood pulse in the lower Amazon floodplain. We hypothesize that there will be significant changes in the food webs across the hydrologic seasons due to changes in sources of production supporting aquatic biomass. Data was collected within a 17,674-km2 area in the lower Amazon floodplain river in Brazil. Fish species from different trophic guilds were captured in 109 aquatic habitat types across 19 lake systems during each period of the hydrological cycle. Muscle tissues were taken and samples analyzed for Carbon (δ13C) and Nitrogen (δ15N) Stable Isotopes. Preliminary results indicate that the food web varied in relation to the flood pulse. Variation in average δ15N of consumers was observed between seasons, with an average δ15N of 8.49 during the dry season and slight increases (10.71) during the rising-water season. Consumers had slightly larger range in δ13C in their tissues during the dry season (-16.82 to -37.95) when compared with the rising water season (-16.00 to -34.95). Results suggest that trophic levels may shift between seasons (increasing in the rising waters) and that sources assimilated by consumers during the dry season may differ spatially more prominently due to lack of connectivity/ habitat isolation that constrain diets to specific habitats. We will further examine how the isospace, niche breadth, and contributions of basal sources to fish biomass change across seasons. This study provides critical information on the roles of the flood pulse and lateral connectivity driving the dynamic food web and flow of energy and matter within floodplain ecosystems.

Vertical Shifts in Diel Hypoxia: Effects on Wetland Habitat Use by Fish

William Bell[3]

Wetlands are dynamic environments driven by abiotic factors such as nutrients, suspended sediment, light, and these can in turn affect aquatic conditions including dissolved oxygen (DO). In summer, diel oxygen conditions can vary from supersaturated to near anoxia over diel cycles and as a function of water depth. Old Woman Creek (OWC), an estuary located in northern Ohio, undergoes these extensive oxygen fluctuations. The goal of this project was to determine how fish use the water column in this shallow, eutrophic wetland as DO conditions change dynamically. Dual frequency IDentification SONar (DIDSON) and multi-depth miniDOT oxygen sensors were used in tandem to quantify diel fish distribution throughout the water column. Additionally, DO profiles and vegetative cover were mapped during day and night to determine the spatial and temporal extent of DO over the diel cycle. Based on preliminary data, only the bottom stratum of the water column was hypoxic during the day (*Ameiurus nebulosus*) and Common Carp (*Cyprinus carpio*). While hypoxic conditions appear to strongly affect vertical distribution in the water column, other factors including light, temperature, predation pressure, and availability of food also are contributors to wetland use by fishes.

Consumption of Invasive Zebra Mussel Veligers by Native Planktivorous Fish in the Ohio River

Dakota Clark[41], Daniel Bryan[41], Brent Murry[41]

Zooplankton play a critical role in river ecosystems; they serve as a food source for countless species of fish and are crucial to food web energy flow between phytoplankton and fishes. Invasive zebra mussels have proliferated throughout the Ohio River. Juvenile zebra mussels called veligers, currently account for over 50% of all zooplankton in the Ohio River during some months. The abundance of veligers could have negative effects on native fish diet, potentially leading to trophic impacts. During summer 2024 we collected 175 fish via boat electrofishing along the Ohio River and its tributaries in John T. Myers, Newburgh, Cannelton pools with an emphasis on the common species; Mimic Shiners, Emerald Shiners, and Bluegill. We also collected zooplankton with a 64-micron zooplankton net to assess prey availability. The fish samples were dissected to complete diet analysis. We compared the stomach contents of native planktivorous fish to available zooplankton to determine whether native fishes select for or against non-native veligers. Ambient zooplankton composition in nursery habitats (drowned river mouths) consisted of on average 27% veligers, 64% rotifers, 7% copepods, and 2% cladocerans. Preliminary results from 15 bluegill sampled showed that their diets consisted of 10% veligers, 9% rotifers, and we found macroinvertebrates made up 75% of all prey items in their stomachs. These preliminary data suggest that bluegill and emerald shiners do in fact consume veligers, but they exhibit a modest level of avoidance, though they appear to select veligers over rotifers. Determining the amount of veliger consumption in the diets of native fish is vital given that these veligers are invasive, and they likely represent a poor food source due to their high silica content and small size. This can cause defects in growth and increased stress.

A Review of Spatial Variation of Mercury Pollution in Sediments, Soils, and Water in the Amazon River Basin

Grace Dacombe[41], Megan Beeksma[41], Shannon Watkins[41], Caroline Arantes[41]

The impacts of mercury exposure in humans have been well documented, with severe physiological effects. However, due to mining, mercury pollution in the Amazon River Basin has increased, this mercury bioaccumulates in fish, which in turn puts these populations, who consume these fish, at risk. We conducted a literature review on mercury contamination in sediments, soils, and water in the Amazon River Basin. Available data was compiled and analyzed to give a better understanding of the spatial variation underpinning mercury contamination as it relates to artisanal gold mining and other such practices in the area. That data was organized by unit and collection method, and the unit was standardized. 16 studies were retrieved from 13 distinct regions across the Amazon. An initial examination showed that in water, mercury concentration varied from a minimum of 0.01 ng/L to a maximum of 222 ng/L, with a mean of 12.9 ng/L and standard deviation of 34.9 ng/L. In sediments and soils, mercury concentration varied from 5E-5 mg/Kg to 9.82 mg/Kg with a mean of 0.397 mg/Kg and a standard deviation of 0.969 mg/Kg. There were significant variations in mercury across study areas which may be attributed to differences in water quality, specific properties of the sediments, and land use/land cover patterns. The data will be analyzed further, examined spatially, mapped using ArcGIS, and analyzed for general patterns. These patterns will be overlayed with land use data over that space to explore relationships between increased mercury in sediments with human activities including artisanal gold mining.

Quantifying the Effects of Vaterite vs. Aragonite in Steelhead Trout Survivorship

Nakiah Dague[3], Jeffrey Miner[3], Kevin Neves[3], John Farver

Otoliths play a critical role in the sensory function of Steelhead Trout (*Oncorhynchus mykiss*). While otoliths typically form as dense aragonite, a large proportion of hatchery-reared individuals exhibit a transition to vaterite (~50%), a less dense and structurally altered polymorph of calcium carbonate. This shift with documented loss of auditory function is thought to be associated with hatchery-induced stressors, such as high densities and/or dietary conditions. Shifts to vaterite in Steelhead Trout otoliths have been linked to selective return of adults suggesting differential mortality or straying by fish with vateritic otoliths. In a laboratory study, we tested the hypothesis that Steelhead Trout of smolt size (~150 mm Total Length) would have greater capture rates when exposed to fish predators if trout had vateritic otoliths. Using mesocosms (10m3) with Little Manistee strain Steelhead Trout (n=10 mesocosms per trial set, two sets), we exposed the trout to Largemouth Bass, (*Micropterus salmoides*) and Walleye, (*Sander vitreus*) predators for two weeks. We then contrasted proportions with vateritic otoliths between the initial stocks of trout and those remaining using Chi-Square analyses (independent analyses for each set). In both sets, there were significant shifts in the proportions of trout with 0, 1, or 2 vaterite otoliths (p=0.012, and 0.006, respectively) with the remaining trout more frequently having no vateritic otoliths. Our results are one of the first to show the direct effect of this otolith shift on early mortality of Steelhead Trout that might be expected upon release into water bodies like Lake Erie or inland streams/lakes. It also suggests that there likely are differential return rates of adults with and without vateritic otoliths, and that strains of Steelhead Trout with high rates of vateritic otoliths may not contribute as successfully to recreational fisheries.

Improvement of the Fish Community of Nine Mile Run (Allegheny County, PA) following Reclamation

Beth Dakin[9], Brady Porter[9], Mike Koryak[13]

Prior to 2002, Nine Mile Run was highly degraded by road runoff, leaking sewer systems, combined sewer overflows, and leachate from a large slag dump. In fish surveys conducted from 1946-1999, only a very few individuals of pollution tolerant species were found. However, in the last 20 years, several major restoration and reclamation projects have been undertaken in Nine Mile Run, including the capture and treatment of slag leachate, modifications of the stream channel, and improvements to stormwater management in the watershed. Here we compare historic and recent electrofishing survey results from two stations along Nine Mile Run and show that the stream has increased tremendously in both fish biodiversity and biomass. The sampling station closest to the mouth of Nine Mile Run shows higher diversity and variable species composition due to fish migration with the Monongahela River, while the upstream station has a moderate number of resident pollution tolerant species and shows occasional fluctuations and extirpations. Despite the improvement that has taken place in the past two decades, Nine Mile Run will continue to face numerous challenges due to its urban location and the unavoidable continuing impacts of buried headwater drainages, runoff from impervious surfaces, and sedimentation. This highlights the need for continued monitoring and management actions in order to make long-lasting, system-wide improvements to Nine Mile Run's biology, hydrology, and geomorphology.

Using High Throughput Sequencing Genetic Analyses to Test for Consumption of Larval Yellow Perch in Piscivorous Fish Diets

Andrew Foley[31], Michael Sovic[11], Manao Kato[31], Stuart Ludsin[31]

Lake Erie is a dynamic freshwater ecosystem that supports important recreational and commercial fisheries. Success of these fisheries is driven by a suite of ecosystem-based factors that particularly influence early life stages when fish are most susceptible to mortality. Understanding mechanisms that influence larval fish success, and thus drive recruitment to the fishery, is vital to maintaining healthy fish stocks. The influence of predation on larval fish is one such mechanism that has been widely explored in previous studies. Specifically, effects of piscivorous fish predation on ichthyoplankton is of widespread interest given its potential impacts across various fisheries. Rapid digestion of small-bodied larva and eggs can be a challenge when performing traditional diet analysis. In response, genetic approaches to identify ichthyoplankton in the gut contents of predatory fish have become more widely applied. Here we describe a new genetic diet assay that utilizes four genetic markers and leverages high-throughput sequencing technologies. The approach targets Yellow Perch, our primary species of interest in the diets of predators, but was designed more broadly to uniquely detect a variety of Lake Erie fish species. It is expected to offer high specificity and sensitivity, includes a built-in control to assess sample quality, is cost-effective, and highly scalable. While the genetic loci contain information to uniquely identify a variety of species, they are designed to be short in length, increasing the likelihood of success in degraded samples. We report preliminary results that show strong promise in identifying known targets with a high degree of accuracy.

Influence of Long Term Seasonal and Annual Climate Patterns on Reproductive Success of Native Brook Trout *Salvelinus fontinalis* across Pennsylvania

Matthew Gaul[12], David Janetski[12]

Climate change is widely expected to have an impact on wildlife populations across the globe. This can be especially true for aquatic animals, where increased temperatures and precipitation have a more pronounced effect on their habitat. The reproductive cycle of the eastern Brook Trout (*Salvelinus fontinalis*) is intimately tied to weather conditions and their effects on the water. Warmer winter water temperatures may result in earlier hatching, and increased precipitation and flooding can scour streambeds, disrupting brook trout nesting sites. The large-scale impacts of changing weather patterns on Pennsylvania Brook Trout populations are largely unknown. To determine the influence of weather patterns on Brook Trout reproductive success, we tested for relationships between seasonal variables (temperature and precipitation) and population data (young-of-the-year [YOY] brook trout relative abundance) from 3,379 streams across the state of Pennsylvania, representing all six major watersheds (Ohio River, Delaware River, Upper and Lower Susquehanna River, Potomac River, and Genesee River) from 2009 to 2023 . Our results showed variable reproductive success from year to year, with poor success across all watersheds in 2011 and 2017. However, across all years we found that the relative abundance of Brook Trout YOY was only weakly related to weather patterns throughout the year. Springtime maximum daily precipitation was associated with a lower abundance of YOY ($p= 0.02$), and higher springtime and winter temperatures were weakly associated with increased YOY abundance ($p=0.01$). Although our results show statistical significance, most of the variation in brook trout reproductive success remains unexplained, as R^2 values were all at or below 0.1. This suggests that variables not considered in our analysis, such as perhaps local conditions and density-dependent factors, may be more influential on Brook Trout reproductive success than large-scale seasonal temperature and precipitation patterns in most years.

Reproductive Ecology of Bluegill in Turbid Waters

Aaron Giganti[31]

Urban and agricultural development are leading to increasing levels of suspended sediments in aquatic systems, resulting in elevated turbidities in lentic habitats. Turbidity is known to impact the visual acuity—and thus a wide range of behaviors—in aquatic organisms. In particular, fish are known to experience reduced foraging success at elevated turbidities. In turn, a deficiency in vital nutrients, such as carotenoids, may not only interfere with the production of gametes, but reduce the intensity of nuptial coloration used to attract mates. Turbidity may also interfere with individuals' abilities to recognize conspecifics and evaluate potential mates, interfering with sexual selection and potentially increasing hybridization. My work seeks to understand the ties between turbidity, morphology, and reproductive behaviors in Bluegill sunfish (*Lepomis macrochirus*) through the contexts of sexual selection and male coloration. In summer 2024, I performed female mate choice experiments to determine how female color preferences varied between clear and turbid conditions in a laboratory setting. Mate choice experiments showed no conclusive evidence of female color preferences, suggesting that other intrinsic male traits or environmental factors may better explain variation in mate choice among wild Bluegill populations. Future planned research will assess relationships between turbidity, condition, pigmentation, and gonadosomatic index (GSI) in male Bluegill to determine whether traits associated with male reproductive success vary across visual microhabitats. Together, these works will contribute to a growing understanding of the visual aspects of reproduction and recruitment in *Lepomis* sunfishes and add to a growing body of work exploring the impacts of anthropogenic turbidity in freshwater habitats.

Characterizing Nursery Habitat for Juvenile Invasive Carp *Hypophthalmichthys spp*. on the Ohio River

Becca Hiller[41], Brent Murry[41], Caroline Arantes[41], Tyler Gross[32]

Since their introduction to US waters in the 1980s, Silver Carp (*Hypophthalmichthys molitrix*) and Bighead Carp (*H. nobilis*) have had widespread ecological impacts on recipient communities. These large, planktivorous fish have rapidly spread throughout the Mississippi River basin and its major tributaries, but their invasion has stalled within the Ohio River. Recent research has suggested a lack of suitable nursery habitat on the Ohio River as a potential reason for this slowed spread. The goal of this project is to quantify what type of habitat juvenile carp are using on the Ohio River. Using a dataset of juvenile carp survey history from 2016-2023, 23 sites were selected in tributaries and embayments across the lower section of the Ohio River. Fish community and juvenile carp abundance data were collected via boat electrofishing and surface trawling. At each sampling site, local and watershed scale environmental variables were collected, including water turbidity, depths, substrate size categories, canopy cover, channel width, zooplankton density by taxa, and chlorophyll-a concentration. We also measured water level and temperature data throughout the early nursery season (July-August) and developed a suite of remote-sensed spatial variables. Characterization of carp nursery habitat could aid managers in identifying vulnerable upstream habitats for site-specific management.

Quantifying the Nearshore Habitat of Seneca Lake Using Side-Scan Sonar

Jack Kinsey[20], Taylor Hunkins[20], Jeremy Pritt[20], Joseph Conroy[20]

In this project, we employed a standardized habitat assessment methodology using side-scan sonar to quantify multiple habitat metrics and display them on a habitat map of our study reservoir, Seneca Lake. Using recreational grade sonar equipment, we scanned Seneca Lake on multiple dates throughout the spring and summer. Ultimately, we generated a habitat map in a geographic information system (ArcGIS Pro) and calculated reservoir-wide values for habitat features, including standing timber, woody debris, vegetation, and substrate type. Goals for future research are to relate habitat metrics to the characteristics of important reservoir sport fish populations and contribute further to a statewide inventory of reservoir habitat maps. Ultimately, the project will provide insight into potential habitat management levers to improve sport fisheries.

Development of a National Park Service Road and Stream Crossing Catalogue

Hannah Klim[25], Paola Ferreri[25], Peter Sharpe[16], John Wullshleger[16]

When roads and streams intersect, culverts—devices used to channel water underneath a roadway, railway, or other types of embankments—are necessary to manage water flow and prevent flooding of these roadways. Culverts have long since existed as infrastructure and have more recently become a relevant subject in the study of aquatic organism passage and habitat connectivity. While millions of these stream and road crossings exist, they are not always catalogued, and the ability of culverts to prevent habitat fragmentation or facilitate organism passage goes unknown. The National Park Service (NPS) is working to prioritize culvert assessment and maintenance to promote aquatic organism passage within NPS parks and properties. The existing NPS culvert map is a component of a larger survey of vehicle crash data (CRASH) within the parks that primarily tracks culverts located on a limited number of roads or ones that could easily be surveyed as a by-product of the vehicle data. A preliminary review of this database indicated that it may be underrepresenting the number of culverts on NPS lands, with culverts in some parks being underrepresented by over 300%. The goal of this project is to assist the NPS by exploring ways to use additional GIS layers to identify potential culvert locations and enhance their existing database. The next step of this project is to select specific parks to ground-truth the culvert location information and assess their functionality using the North Atlantic Aquatic Connectivity Collaborative (NAACC) protocols. Using a case study approach, this project will help provide a catalogue of potential culverts on NPS lands that can be used to facilitate their efforts to enhance aquatic organism passage.

Round Goby Foraging Patterns under Current and Projected Climate Conditions of Lake Erie

Alisa Mancini[31], Lauren Pintor[31]

Climate change and anthropogenic influences negatively impact global ecosystems, with freshwater ecosystems disproportionately affected – 25% of all freshwater fish species are facing extinction. The Great Lakes are already experiencing warming temperatures, harmful algal blooms, and species invasions, all of which induce stress on the ecosystem. Invasive species are often transported knowingly and unknowingly through anthropogenic actions. If these species successfully establish in a new area, they can wreak havoc on native species populations and the natural flow of the ecosystem. Round gobies (*Neogobious melanstomus*), which originate from the Black Sea, Caspian Sea, and the Sea of Azov, were introduced to the Great Lakes through ballast water transport and have been found in Lake Erie since 1990. Round gobies prey on the eggs and fry of darters, Logperch, and Smallmouth Bass. However, after decades of species interactions and adaptations, they are now an abundant food source for many native Lake Erie species. As a result, knowing how invasive species respond to climate change is critical in predicting and assessing ecosystem threats and alterations. A laboratory study was conducted to understand how increased water temperature, reduced dissolved oxygen, and elevated turbidity influence foraging behavior and risk-taking of round gobies at different life stages. A giving-up density framework was used to analyze feeding preferences on blood worms at near and far patches, relative to a refuge site. Foraging and risk perception dictate growth, reproduction, and survival. By understanding how climate change influences these life history traits, predictions can be made regarding Round Goby success and survival. This can then be used to understand whether native species are expected to experience a change in predation pressure or prey availability. Ultimately, combining this knowledge with responses to climate change will allow for the development and implementation of comprehensive species management plans for native species.

Assessing Invasive Carp Impacts on Native Fish Assemblages on the Ohio River

Luka Marques Do Amaral[41], Caroline Arantes[41], Brent Murry[41], Friedrich Keppeler[37], Erin Shepta[41]

Biological invasions pose a global threat to biodiversity due to their potential to disrupt ecosystems and alter community structure. Invasive species can alter the abundance of native species, and their impacts can vary spatially and temporally. Freshwater ecosystems, in particular, can be vulnerable to such invasions due to their innate characteristics. In the U.S., the introduction of invasive carp into the Mississippi River basin during the 1970's led to their spread and subsequent impacts on aquatic ecosystems, resulting in economic and biodiversity losses. Although evidence suggests that invasive carp are impacting certain species in this basin, little is known about their broad assemblage level impacts. Our objective was to evaluate whether invasive carp alter the relative abundance of native fish assemblages in the Ohio River. We utilized a subset of the fish community data from the ORSANCO (Ohio River Valley Water Sanitation Commission) long-term monitoring project, consisting of 32 years of data (1991-2023) collected along the 1,579 km extent of the Ohio River. Our study area ranges from the confluence of the Mississippi and the Ohio River where invasive carp populations are established and reproducing, to the Hannibal Locks and Dam in Pennsylvania, an area still uninvaded. We employed a model-based multivariate framework for analyzing abundance data to evaluate spatial and temporal changes in native fish assemblages along a gradient of invasion. We hypothesize that native fish abundance will be strongly influenced by invasive carp in the lower section of the Ohio River, where they are established and reproducing. Our findings should help inform conservation efforts by identifying which native species are most impacted by the invasive carp.

Fish Access in Reconnected Lake Erie Wetlands

Alexandra Marshall[3], Jeffrey Miner[3]

Since the 1860's, 96% of Western Lake Erie's coastal wetlands have been drained and filled. The long history of draining and diking Lake Erie's coastal wetlands has led to detrimental impacts to water quality, habitat and the species that inhabit them. The Great Lakes Restoration Initiative (GLRI) began in 2010 with one of its goals to protect native habitat and to therefore sustain its native species. Through this funding, Ottawa National Wildlife Refuge (ONWR) has implemented several projects to restore and reconnect their coastal wetlands. Many of these projects have included fish passageways/water control structures, which should allow for natural hydrology and increased movement of aquatic species. The objectives of the study were to 1. Quantify patterns of fish movement through the passageways as a function of environmental variables 2. Identify the fish community using both sides of the reconnections and 3. Survey users of ONWR to understand public perception and interaction with restoration projects. We evaluated three fish passageway sites. One of these passageways had been closed for a year; this site was sampled, then the passageway was opened and resampled after about two weeks. Fyke nets and DIDSON sonar were used to evaluate the ecological payoff of the passageway implementation. Data analysis is ongoing, along with the public perception survey. Results show that fish passageways allow for a stable, diverse fish community that will reach an equilibrium after only a short time of restoration being complete.

Invasive Leaf Litter's Effect on Macroinvertebrate Communities in an Impaired Appalachian Creek

Noah Meyer[39], Reagan Bally[39], James Wood[39]

Water quality is impacted by a variety of anthropogenic actions, often resulting in alteration of pH, increases in dissolved salts and metals, and increased turbidity which can lead to reduced macroinvertebrate diversity and abundance. Anthropogenic activities can also facilitate the introduction and spread of invasive exotic plants such as Japanese knotweed (*Reynoutria japonica*), a common riparian plant along many Appalachian streams. To better understand the effects of anthropogenic activity and invasive plant species on macroinvertebrates communities in streams, we conducted a study in two Appalachian streams, one with low levels of urbanization and high forest cover (Castleman's Run) and one with more urbanization and lower forest cover (Long Run). We hypothesized that 1) more urbanized streams would have lower macroinvertebrate diversity, and 2) macroinvertebrate diversity would be higher in leaf packs from native riparian species *Acer saccharinum* (Silver Maple) compared to the invasive exotic *R. japonica*. To conduct our experiment, we created leaf packs of the two species and deployed twelve replicates of each leaf pack type into the creeks. After three weeks, leaf packs were removed, and all macroinvertebrates were identified to family and grouped by function-feeding group. We found that *A. saccharinum* leaf packs had greater macroinvertebrate abundance as compared to *R. japonica*. Shredding function-feeding group abundance was significantly higher in *A. saccharinum* packs compared to R. japonica packs. We also found that the more urbanized streams had significantly less macroinvertebrate abundance because of the higher SPC

In Bloom: Congruence Between Zooplankton and Larval Fish Phenology in the Ohio River

Brandon Mundy[41], Brent Murry[41]

The larval stages of fish life history is widely regarded as the most critical life stage due to their vulnerability to environmental factors. During the post yolk sac stage fish are energetically vulnerable and rely upon zooplankton as prey. Their success in finding sufficient zooplankton affects recruitment cohort size. It is widely hypothesized that larval fish evolved to react to environmental cues to match zooplankton blooms. In some systems this leads to temporal linkages between their densities, however recent research has demonstrated a large seasonal shift in the timing of zooplankton blooms. We sought to assess the relationship between larval fish and zooplankton abundance and hypothesized a disconnect between peaks in larval abundance and their zooplankton prey. This study compares and contrasts the seasonal phenology of larval fish and zooplankton. We collected zooplankton and larval fish from tributaries to the Ohio River spanning from Point Pleasant, WV to Aurora, IN which is approximately 363 river kilometers. Collections were made 2021 – 2023 from May to July. We collected zooplankton via diaphragm pump and identified using a dissecting microscope. Fish larvae were collected via 3 minute trawls and identified to family using a dissecting microscope. Densities were calculated for both fish larvae (larvae/ liter) and zooplankton (count/liter). Ingress of taxa is shown at 15% and egress is shown at 85% of annual abundance. We will discuss the match (overlapping peaks) and mismatch (differing peaks) of fish larvae and zooplankton prey and implications to fish recruitment.

Total Phosphorus Dynamics in Tributaries of the Tioga Watershed

Cole Pennington[7], Gregory Moyer[7], Graham Zechman[7], Hunter Hunter[7]

Phosphorus is an essential nutrient in aquatic ecosystems; however, excessive phosphorus loading in aquatic ecosystems can lead to eutrophication and harmful algal blooms, threatening water quality and ecosystem sustainability. While phosphorus naturally enters aquatic systems through the mechanical weathering of rocks, anthropogenic activities—particularly agricultural runoff—have significantly increased its input to freshwater systems, often greatly exceeding natural levels. Our study examined total phosphorus concentrations over a nine-month period in tributaries of two PA streams in Tioga County: Crooked Creek and the Tioga River – both of which flow into Hammond and Tioga Reservoirs, respectively. Tributary/site selection was based on spatial analyses that showed increased agriculture land us in each watershed. The objective was to determine whether significant differences existed in phosphorus levels among five sampling sites within each system and to identify any site contributing excessive phosphorus. Additionally, we assessed the impact of high-water events on phosphorus loading. Water samples were collected monthly from five locations in each tributary, with in-field measurements of pH, temperature, and conductivity. Laboratory analyses included alkalinity and total phosphorus concentrations. Results indicated no significant differences in phosphorus loading between the sites of each water bodies or during high-water events. The average total phosphorus level was 0.038 (range 0.005 to 0.15) mg/L in tributaries to Crooked Creek and 0.013 (range 0.007 to 0.021 mg/L in tributaries to Tioga River. The US EPA recommends limiting total phosphorus in streams to 0.1 mg/L and to 0.05 mg/L for streams entering reservoirs to control eutrophication. While our average total phosphorus values were less than these limits, one Crooked Creek tributary did exceed these values suggesting that anthropogenic activities may be influencing levels for this stream.

Redesigning Large River Telemetry Receiver Setups

Bryce Sayre[40], Macey Rowan[40], Katherine Zipfel[40]

Large, commercial river systems with highly variable flows, constant vessel traffic, and a biodiverse ecosystem cause many challenges to monitoring fish movements. The Ohio River encompasses over 900 miles of an ever-changing ecosystem with just under 300 miles that borders West Virginia. With limited staff to manage these waters, understanding fish movement and habitat use is vital to successful management of native and invasive fish populations. As the number of invasive carp continues to expand their reaches upstream in the Ohio River, so do the potential negative impacts these fish can have on this river system, and the people who use it. Better understanding of where and when invasive carp are located within the system helps to more accurately target these fish for removal efforts to slow their expansion. In coordination with other Ohio River states and federal agencies, West Virginia Division of Natural Resources (WVDNR) joined a river-wide telemetry project to better understand invasive carp movements. Since the start of the telemetry project, receivers have been deployed from navigational buoys, navigational posts, and attached at the bank with steel cable. Many of these deployments were vulnerable to being tampered with and lost due to commercial and recreational boats or floating debris which lead to significant project costs and loss of data. We designed a new setup to reduce equipment loss while also increasing detections. The new assembly has a stainless-steel swivel, a breakaway carabiner, smaller float, streamlined shape, and lighter anchor. This new design minimizes the chances of becoming snagged on debris, allows the receiver to be deployed in a safe place away from damage or tampering from boaters, keeps the receiver at a better angle to optimize detections, and to make it easier and safer to be deployed and retrieved by one person.

Evaluating Effects of a Small Impoundment on Physical Habitat and Stream Biota: A Case Study of Lake Perez on Shaver's Creek, Huntingdon County, PA

Kirsten Smith[25], Paola Ferreri[25]

Dams across the globe fundamentally change freshwater ecosystems, altering stream habitat and the biodiversity they support. While the impacts of small impoundments on macroinvertebrate communities are recognized, research and temporal monitoring of affected streams are limited. Shaver's Creek, a tributary of the Juniata River in Central Pennsylvania, provides an ideal setting for evaluating the effects of a small impoundment on a stream ecosystem. The goal of this study was to evaluate the effect of Lake Perez, an impoundment created by a dam on Shaver's Creek, on the physical habitat and biota found in the stream. We evaluated fish, benthic macroinvertebrates (BMI), and physical habitat in Shaver's Creek at three sites upstream and one site downstream of the impoundment; all sites were located within the Penn State Experimental Forest and the adjacent Rothrock State Forest. Three samples of BMI were collected at each site using the Pennsylvania Department of Environmental Protection (PA DEP) freestone stream protocol. Physical habitat was evaluated with the PA DEP Physical Habitat Evaluation Form for Riffle/Run Prevalence. Fish were sampled using a single-pass of backpack electrofishing in a 100m reach at each site. Using Nonmetric Multidimensional Scaling (NMDS), we found differences in BMI community composition between the sites above and below the dam, with Simuliidae and Oligochaeta being most abundant below the dam. Sites just above and below the impoundment scored lower on the habitat evaluation, and fish species composition in the site below the dam was different from those upstream of the impoundment. The differences in physical habitat, BMI, and fish community composition indicate that even small impoundments can affect stream habitat and biota.

DNA as a Tool: A Summary of how Genetics can Inform Conservation and Management in Fisheries and Wildlife

Michael Sovic[11]

DNA stores the code for an individual's traits, and also serves as the vehicle by which that code is passed along generations. But the information in DNA goes far beyond its direct impact on traits. History is written in to DNA as a by-product of how the code is modified and transmitted over time. Levels and patterns of variation allow us to do things like assign an individual to a population of origin, or infer characteristics of that same population as it existed long ago. While DNA can provide a wealth of information for specific questions, other questions are beyond the scope of genetic analyses. Indeed, DNA is best viewed as one tool in a larger analytical toolbox. Even within the types of questions for which DNA is well-suited, not every section of DNA, or locus, in a genome is equally informative. As a result, it's helpful to tailor a genetic dataset to the specific goals of a study. Methods for generating DNA data continue to evolve, and a growing availability of high-throughput technologies has greatly expanded the scale of datasets we can produce. These larger datasets can not only increase analytical power, but in some cases allow researchers to address types of questions that were previously out of reach. This presentation will summarize and compare common methods for generating DNA-based data, and provide some examples of how such data can be used to inform conservation and management within fisheries and wildlife systems.

Preliminary Evaluation of Phylogenetic Patterns of Fishes in Upper Shavers Fork, WV

Michael Sovic[11]

Both historic and contemporary factors impact current distributions of species and their patterns of genetic diversity. In turn, those patterns of diversity can be used to infer past events. Freshwater fishes native to eastern North America provide great opportunities to explore and test hypotheses related to the potentially dynamic histories of lotic systems. Indeed, a number of biogeographic and phylogeographic studies have been performed on native fishes, helping shape our understandings of things like how past geologic events, such as the Pleistocene glaciations, impacted the landscape and its associated biodiversity. These studies often, and justifiably, make efforts to include samples from areas known to harbor distinct assemblages of diversity, such as the waters of the upper Kanawah and New rivers in West Virginia. However, samples from other areas, such as the nearby headwaters of the Cheat River, including Shavers Fork, have received less representation in phylogeographic studies. This study provides an initial exploration of phylogeographic structure of fishes in the upper reaches of Shavers Fork by placing newly collected samples from two species, Central Stoneroller (*Campostoma anomalum*) and Northern Hogsucker (*Hypentelium nigricans*) into a broader phylogeographic context constructed with data generated and made publicly available as part of previous phylogeographic studies of each of these species.

Theory to Application: Community Size Spectra can Inform Management Actions

Andrew Stegmann[41], Brent Murry[41]

Fisheries management has historically been single-species focused, but there is growing awareness of the benefits of integrating food web approaches, as species dynamics are shaped by multiple interacting environmental and ecological drivers. However, the application of food web-based management remains limited in freshwater systems due to high data requirements and impracticality for widespread use. Community size spectra (CSS) are an alternative approach to single-species analyses that requires minimal data while effectively describing food web structure through the distribution of abundance across body size gradients. CSS is characterized by two key parameters: slope, which represents ecological efficiency, and elevation, which reflects ecosystem capacity. A shallower slope indicates increased abundance of large-bodied individuals compared to small-bodied individuals, and the inverse is true for steeper slopes. We examined four major challenges affecting freshwater systems-aquatic invasive species, climate change, acid mine drainage, and land cover change-by reviewing literature where CSS have been applied to assess its potential for guiding management actions. An increase in size spectrum slope (flattening) was observed in river ecosystems at high densities of invasive carp, and a steeper slope was observed pre-invasion. Increasing mean summer temperatures in both lakes and reservoirs also had a positive effect on slope, and total phosphorus had contrasting effects, negatively influencing slope of natural lakes and positively affecting it in reservoirs. In acid mine drainage-impacted systems, a shallower slope and a significant reduction of the elevation was observed. Additionally, CSS reacted to the loss of littoral habitat and water quality degradation in natural lakes, while common taxa-based bioindicators did not. These results highlight the potential of CSS as a valuable tool for detecting food web shifts and ecosystem changes, offering a practical approach to guide management efforts in freshwater systems.

Development of Community Size-Spectra-Based Indices of Biotic Integrity for West Virginia Wetlands

William Thompson[41], Andrew Stegmann[41], Brent Murry[41], Sindupa De Silva[41], James Anderson[5]

Wetlands are important habitats providing critical ecological services such as maintaining water quality and supporting biodiversity. Wetlands are, however, extremely susceptible to anthropogenic insults that degrade the services they provide. Assessing wetland health, or integrity, is a critical step toward their management. The presence and abundance of sensitive and tolerant macro-invertebrates serve as indicators of wetland integrity. In the present study we are evaluating the ability of a novel body size-based approach, the community size spectra, to assess wetland condition and functionality. Size spectra measure the distribution, or rate of reduction (slope) of organismal abundance relative to increasing body size. Macro-invertebrates were collected from 48 wetland sites in West Virginia using D-nets and were individually measured. Taxon-specific equations were utilized to convert total length (mm) into dry mass (mg). Individual organism masses were used to construct site-specific size-spectra. We hypothesized that changes in the size-spectra slopes (representing food web transfer efficiency) of wetland sites will be correlated to changes in macroinvertebrate functional group relative abundance and ultimately to pollution and disturbance gradients. We expected hydrologically stable wetland systems to show strong body-size: abundance relationships, while wetlands experiencing common drying events are likely to show weak to no relationship. Literature suggests that large-bodied, low-trophic position organisms will flatten out the slope of the size spectra and we will see if this carries over to wetlands. We also hypothesize that different environmental variables will have some effect on the abundance of macroinvertebrate functional groups. Thus, size-spectra may prove to be a useful non-taxa-based metric assessing food web structure that can provide added value to existing taxon-based IBIs to guide wetland restoration.

A Preliminary Comparison of Net Mesh Size: Larger Mesh Increases Grass Carp Catch while Reducing Bycatch

Eric Thompson[36], Ryan Young[32], Eric Weimer[20], Christine Mayer[36], Robert Mapes[36], Ryan Brown[36]

Efforts to remove invasive Grass Carp from Lake Erie have been ongoing since 2018. Between 2020 and 2024 Grass Carp captures using conventional methods such as electrofishing and trammel nets have declined in the mainstem Sandusky River. Consequently, crews began using alternative capture methods such as overnight gill nets. Two different sizes of mesh were used and crews anecdotally noticed a difference in capture rates between these two nets. Our objective is to determine which gill net mesh size most efficiently captured Grass Carp. In 2024, crews set two sizes of gill net (8 and 8.5 inch stretch size) overnight in the Sandusky River. We calculated Grass Carp capture and bycatch per net-foot and compared mean values using t tests. We also compared time spent pulling in each net using a subset of gill net events. In order to determine if Grass Carp avoided nets with high levels of bycatch we compared number of bycatch in nets that captured 0 Grass Carp with nets that captured 1 or more Grass Carp. The 8.5 inch nets caught more than double the amount of Grass Carp per net-foot than the 8 inch nets. Number of bycatch and pull time were both lower for the 8.5 inch nets compared to the 8 inch nets. The number of bycatch between nets that caught 0 Grass carp did not differ significantly from nets that caught 1 or more Grass Carp. Overall, 8.5 inch nets caught more Grass Carp, less bycatch, and took less time to work through. Gill net deployment in 2024 focused on removal instead of planned comparison, mesh sizes were not systematically interspersed, therefore a comprehensive gear comparison study is warranted. Regardless, this size of net is promising for future removal efforts.

Quantifying Steelhead Trout Smolt Emigration Rates Using DIDSON

Joseph Toth[3], Jeffrey Miner[3], Kevin Neves[3], John Farver

Emigration out of riverine systems by Steelhead Trout smolts (*Oncorhynchus mykiss*) can be a period of high mortality from predation. While in-stream stocking is necessary for imprinting and return as adults, minimizing time spent in the river system can substantively increase chances for smolt survival. This is why the Ohio DNR stocks ~400,000 smolts annually in river mouth areas, and it is suspected that smolts emigrate quickly out into Lake Erie. To quantify the timing of emigration after stocking, we employed a sonar system (DIDSON) to quantify the emigration rate during two stocking events in 2024 at the Rocky River in Ohio. The DIDSON was set approximately 1.5 km (one mile) downstream of the stocking location and perpendicular to the channel. Sonar data was recorded to observe the change in activity for seven days following each stocking event. Recording began twenty-four hours prior to the first stocking to gain a baseline fish activity level within the target size range (180-230 mm). To reduce quantification effects from large schools of yearling Gizzard Shad (*Dorosoma cepedianum*), data were analyzed with a manual subsampling method, including fish traveling downstream between the sizes of 180mm and 230mm in groups of less than twenty individuals. Fish were counted five minutes of every half hour for twenty-four hours prior to the stocking, and five minutes of every hour for fourteen days following the first stocking. Preliminary evidence suggests that smolts emigrate quickly within the first few days after stocking confirming fishery managers expectations and reinforcing the value of late season stocking to promote quick emigration.

Assessing Walleye Spawning Habitat at Nearshore Reefs in the Central Basin Of Lake Erie

Samantha Truckly[20], Taylor Hunkins[20], Ann Marie Gorman[20], Andrew Gable[20], Amanda Popovich[20], Daniel Blake[19], Carey Knight[20], Peter Jenkins[20]

There are many known Walleye spawning sites in the West and East basins of Lake Erie, but only two have been identified in the Central Basin. Recent research indicates that the Hardy Point Reef (HPR), a 1.5-hectare area ranging from 0.3 to 4.5 meters in depth, is being used for Walleye reproduction. The goal of this study is to quantify the habitat at HPR and extrapolate findings to nearby areas with the aim of identifying additional Walleye spawning reefs in the central basin. Sonar side scans and depth measurements were obtained using an HDS-12 Lowrance head unit and transducer. These datasets were combined with Trimble R1 coordinates to create a bathymetric map. Substrate delineation was performed in ArcGIS and applied with random drop points to ground-truth with GoPro imagery. Preliminary research at two other potential reefs near Lake Erie Bluffs and Madison yielded insufficient data to create accurate maps. Future work will focus on ground-truthing the substrate at HPR and investigating the other potential reef areas. Areas with results similar to HPR will be surveyed using gill nets, egg mats, and light traps to assess Walleye spawning activity and recruitment success.

Broad Scale Spatial Analysis of Mercury Contamination in the Amazon

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Mercury (Hg) and methylmercury (MeHg) contamination negatively impacts aquatic ecosystems and human populations globally. Hg and MeHg contamination in the Amazon River Basin stems primarily from small-scale artisanal gold mining activities which use mercury to separate gold from other substances and is then discarded into the environment. In this study we conducted a literature review to examine the spatial distribution of mercury and methylmercury contamination in fish across aquatic ecosystems in different parts of the Amazon. Concentrations of mercury in fish were compiled along with coordinates to spatially analyze trends in the data. The concentration unit was standardized according to sample and geographic coordinates were converted into DMS. If coordinates were not present in the literature, they were estimated using ArcGISPro. Preliminary exploration of the data showed that mercury contamination was present in many regions of the Amazon River basin, such as the Madeira, Madre de Dios, and Tapajos rivers. Significant variation in mercury concentrations was observed across study areas which may be associated with land cover, bioaccumulation, and distance from source input. Spatial analysis in GIS will be used to analyze distribution of MeHg and Hg in different fish species and to examine spatial trends in the contamination.

Tracking Movement and Habitat Utilization of Invasive Carp within the Presence Front of the Ohio River

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Invasive bigheaded carp (Silver Carp *Hypophthalmichthys molitrix* and Bighead Carp *H. nobilis*) are a well-known and established aquatic invasive species within the Mississippi River Drainage. As their range continues to expand, state, federal, and university managers establish new projects aimed to better understand and manage these invasive species. However, many low-density, or "presence front", locations lack valuable fish movement and habitat utilization data. Within the Ohio River, the presence front ranges from the Meldahl Lock and Dam facility (RM 436.2) at Foster, KY to the Belleville Lock and Dam facility (RM 203.9) at Reedsville, OH. We will look to capture invasive bigheaded carp (n ≥ 8) within the Robert C. Byrd Pool and surgically implant acoustic transmitters (Vemco V16-6x-A69-1604) into the body cavity. Stationary acoustic receivers (Vemco VR2Tx and Nex Trak R1) will be deployed within the upper reaches of the Ohio River presence front at strategic locations within mainstem and tributary locations to monitor movements and habitat utilization. This movement data will then be correlated with water temperature and flow data to increase our knowledge and understanding of temporal utilization, which could result in more effective future removal efforts. Our data will augment existing data from a larger invasive carp telemetry project ongoing in the lower reached of the Ohio River. We will use our data to compare movement patterns of invasive carp in differing population densities in variable river conditions.

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18 Nolde Forest Environmental Education Center
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20 Ohio Division of Wildlife
21 Ohio River Valley Water Sanitation Commission
22 Oklahoma State University
23 Pennsylvania Fish and Boat Commission
24 Pennsylvania Native Fish Coalition
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