2025 Annual Meeting

February 4-6

Pickwick Landing State Park

Counce, TN

2025 TNAFS Meeting Schedule

All activities are in The Lodge at Pickwick Landing State Park, Conference Room C (C1-3) unless otherwise noted.

Tuesday, February 4 (all times in Central Standard Time)

7:30 – 5:00 Registration open

8:00 – 4:30 Workshop I: Aquatic Macroinvertebrates

8:00 – 12:00 Workshop II: eDNA - Part 1 – Sample Collection

1:00 – 4:30 Workshop II: eDNA - Part 2 – Data Processing

5:30 – TBD Informal Social: invasive carp fish fry at the Cabin 2 (BYOB)

Wednesday, February 5

7:30 – 5:00 Registration open

8:00 – 11:30 Workshop III: Mussel Identification

8:00 – 11:30 Workshop IV: Basic Fish ID

1:00 – 1:10 Welcome speech and announcements

1:10 – 3:10 Session I: Student Symposium

3:10 –3:30 Break

3:30 – 4:25 Session II: Lightning Talks

4:30 – 6:00 Business Meeting

6:30 – 10:00 Banquet, Awards, Auction, and Poster Viewing & Judging

Thursday, February 6

8:30 - 8:35 Good Morning Welcome & Announcements

8:35 - 9:55 Session III: Contributed Presentations

9:55 - 10:15 Break

10:15 - 11:35 Session IV: Contributed Presentations Continued

11:55 - 12:00 Closing Remarks, Meeting Adjourned

2025 TNAFS Session Schedule - February 5

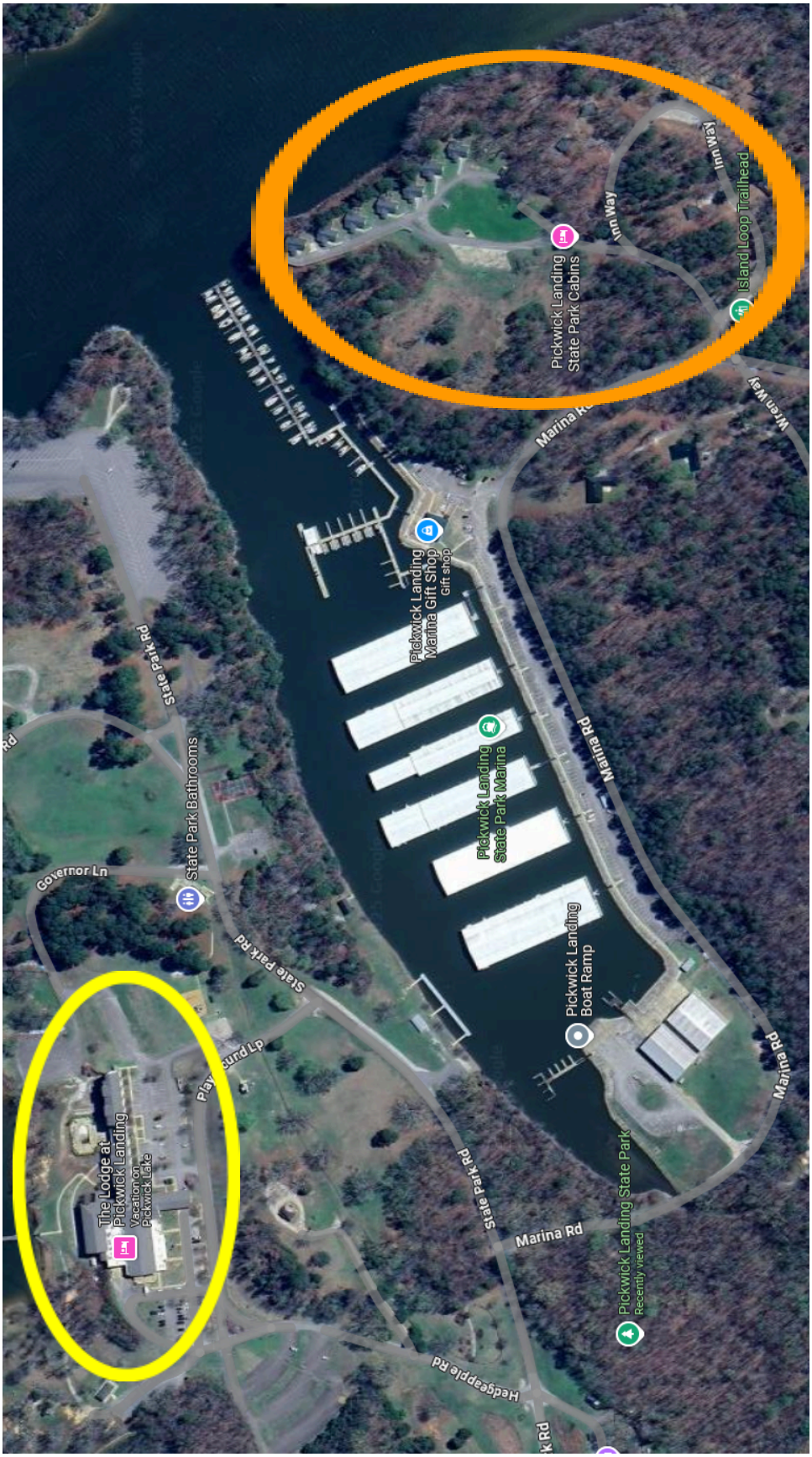
***all times in Central Standard Time; Conference Room C in The Lodge**

1:00		**Welcome & General Information — Sally Petre**
SESSION I: STUDENT SYMPOSIUM *moderator: John Hammonds*		
1:10	1	A Quantitative Synthesis Comparing eDNA Metabarcoding and Conventional Sampling in Freshwater Fish Assemblages - **Tony Kumetis**
1:30	2	Evaluation of Striped Bass (*Morone saxatilis*) Seasonal Movements and Predation on Stocked Trout in the Lower Caney Fork River - **Dalton Bonds**
1:50	3	Using a combination of habitat modeling and environmental DNA surveillance to determine the presence and distribution of critically imperiled, benthic, and cryptic fish - **Hannah Swain-Menzel**
2:10	4	Freshwater Mussels of the Hatchie: Distribution, Composition, and Abundance - **Katelynn Sallack**
2:30	5	Modeling the effects of increased Paddlefish (*Polyodon spathul*a) fecundity on total population size and growth in Lake Cumberland, Kentucky - **Ashley Garrison**
2:50	6	Mixed Company: The Importance of Interspecies Interactions in Minnow Communities - **Christian Swartzbaugh**
BREAK		
SESSION II: LIGHTNING TALKS *moderator: Shawna Fix*		
3:30	7	Impacts of incidental catch of Lake Sturgeon in the Southeastern United States - **Brandon Simcox**
3:35	8	Using Parentage Analysis to Fine Tune Morone Stockings on Percy Priest Reservoir - **Ted Alfermann**
3:40	9	Population Status of the Teardrop Darter (*Etheostoma barbouri*) in Tennessee - **Alex Bybel**
3:45	10	Invasive Carp Program Overview - **Cole Harty**
3:50	11	Reelfoot Lake Invasive Carp Movement - **Tom Flanagan**
3:55	12	Invasive Carp Exploitation Project Update - **Matt Combs**
4:00	13	Invasive Carp Surveillance in Eastern Tennessee - **Ashley Padgett**
4:05	14	Monitoring for Invasive Carp Recruitment on Kentucky and Barkley Reservoirs - **Logan Wilburn**
4:10	15	Past, present, and future: the struggle of fish and fisheries below Center Hill Dam - **Justin Spaulding**
4:15	16	TNAFS Presentation - **Sally Petre**
4:30 - 6:00		BUSINESS MEETING
6:30 - 10:00		BANQUET, AWARDS, AUCTION, POSTER VIEWING & JUDGING

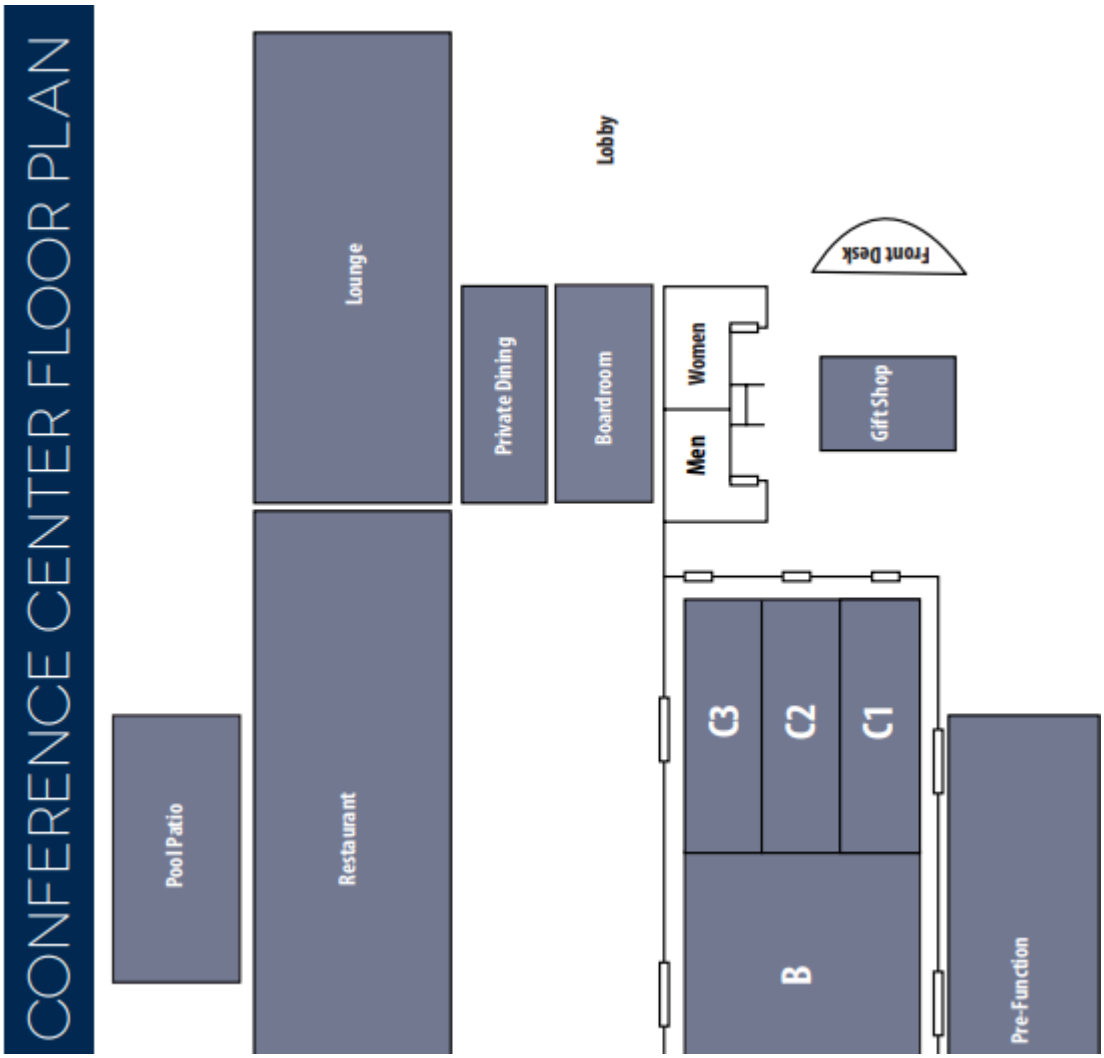
2025 TNAFS Session Schedule - February 6 *all times in Central Standard Time; Conference Room C in The Lodge		
8:30	**Good Morning Welcome & Announcements — Shawna Fix**	
SESSION III: CONTRIBUTED PRESENTATIONS *moderator: Nathan Warden*		
8:35	17	The Race to Save the Laurel Dace: A Fish Out of Water - **Bernie Kuhajda**
8:55	18	Working toward the recovery of the Pale Lilliput (*Toxolasma cylindrellus*) - **Kristin Womble**
9:15	19	Conservation Fisheries, Inc: Past, Present, and Future of Freshwater Conservation in the Southeastern United States - **Shannon Murphy**
9:35	20	Lake Sturgeon Recovery Efforts in the Southeast United States: Where are we after Two-Decades of Restoration? - **Brandon Simcox**
BREAK		
SESSION IV: CONTRIBUTED PRESENTATIONS cont. *moderator: Phillip Parsley*		
10:15	21	Avian Predation on Rainbow Trout in a Tennessee Tailwater Fishery - **Connor Ballard**
10:35	22	West TN Mussel Restoration Planning - **Kayla Key**
10:55	23	Region 1 Habitat Update **- Tom Flangan**
11:15	24	Aquatic Connectivity Activities for the Recovery of the Slackwater Darter - **Shawna Fix**
CLOSING REMARKS & MEETING ADJOURNED		

Map of Pickwick Landing

Cabins



Lodge



General Meeting Information

All meeting activities will be held at the Lodge at Pickwick Landing State Park in Conference Room C unless otherwise noted in the program.

Informal Social Tuesday night! There will be an informal fish fry social on Tuesday night outside Cabin 2. Starting at 5:30 PM CST.

Silent auction: There will be items available to bid on set up in the back of room C. Bidding will end at 9:00 pm on Wednesday, February 5th during the banquet. Payment is due by the end of the meeting. Please find a member of the Executive Committee (Abbey, Shawna, Sally, Meredith) to make payment and receive your item. This auction helps fund all of TNAFS activities, student awards, and more, so your contribution is much appreciated!

Meal Information

Complimentary continental breakfast is offered to lodge guests Monday through Friday from 7 am to 10 am.

Lunch is on your own. Please find a guide to local restaurants below.

The informal social is an invasive carp fish fry that will take place at the cabins in the park beginning at 5:30pm on Tuesday, Feb 4th. Fish, sides and non-alcoholic beverages will be provided, otherwise BYOB.

The banquet will be a buffet fajita bar with a vegetarian option on Wednesday, February 5th and will be located in room C at 6:30pm CST.

Each registrant will receive 2 drink tickets. Choice of drinks are as follows: Beer (Sam Adams Lager and seasonal, Yuengling, Hineken,Corona, State Park Blonde Ale, IPA) and house wine (Chardonnay, Cabernet, Merlot, Pinot Grigio and Noir, Riesling, and White Zinfandel).

Local Restaurant Guide

The Restaurant at Pickwick Landing State Park *on site*
120 Playground Lp, Counce, TN 38326
The space now features a full-service restaurant, bar, and lounge where guests can enjoy a warm meal or craft cocktail while looking out over Pickwick Lake and Pickwick Dam.
https://tnstateparks.com/restaurants/pickwick-landing

Dave's Burger Barn
7470 TN-57, Counce, TN 38326
Small shack with burgers, hot dogs, fries, soft drinks.

R & B Barbeque & Restaurant
7285 TN-57, Counce, TN 38326
Typical BBQ Menu

Pickwick Sports Bar & Grill
9165 TN-57, Counce, TN 38326
https://www.facebook.com/people/Pickwick-Sports-Bar-Grill/61553600924527/?mibextid=ZbWKwL

Jane's Diner
6845 TN-57, Counce, TN 38326
Sandwiches, salads, chicken, steak, seafood

Taylor's Place 2
6510 TN-57, Counce, TN 38326
Sandwiches, burgers, fries, soft drinks

Subway
6418 TN-57, Counce, TN 38326
Sandwich shop

Mamaw's
9830 TN-57, Counce, TN 38326
BBQ, burgers, sandwiches, southern comforts

Pickwick Pizza CO
9850 TN-57, Counce, TN 38326
Pizza


The Restaurant at Pickwick Landing
Pick Park
Pickwick Landing State Park
57
Dave's Burger Barn
Packaging Corporation of America
R & B Barbeque & Restaurant
Red Wood Hut
57
Pickwick Sports Bar & Grill
57
Hampton Inn Pickwick Dam-At Shiloh Falls
Pickwick Pizza CO
Mamaw's

MEETING ABSTRACTS

Poster Session

*indicates presenting author

1. Preliminary Evaluation of Two Active-Sampling Methods for Crayfishes on the Southern Cumberland Plateau, Tennessee

William G. Wells* (University of the South (UoS)), Marley Barton (UoS), Katie McGhee (UoS), and Graham Nystrom (UoS)

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In this preliminary study, we measured and compared the effectiveness of electrofishing and kick-seining sampling methods for crayfishes from 4 headwaters streams on the Domain of the University of the South. The University of the South is located on the southern Cumberland Plateau ecoregion in Sewanee, TN. Specifically, we examined how many individuals were captured between gears, and carapace-length differences between capture methods during March–April 2024. Focal species were *Cambarus sphenoides* (Triangleclaw Crayfish) and *Faxonius placidus* (Bigclaw Crayfish). Four times as many crayfish were captured on average with the electrofishing method (13.5 ± 4.1 crayfish) compared with the kick-seining method (3.0 ± 1.1 crayfish) across all 4 streams. Captured crayfish were of similar sizes using both methods. The higher catch rate from electrofishing compared to kick seining demonstrates that electrofishing is the best sampling method for headwater streams tested on the southern Cumberland Plateau for Triangleclaw Crayfish and Bigclaw Crayfish.

2. A Checklist of the Crayfishes, Ichthyofauna, and Herpetofauna of the Domain of Sewanee: the University of the South **Student Competition

Kabir Menon* (Sewanee: The University of the South) William G. Wells (Sewanee: The University of the South), Kristen K. Cecala (Sewanee: The University of the South), David A. Neely (Sewanee: The University of the South), Angus Pritchard (Sewanee: The University of the South), and Carl T. Williams (Tennessee Wildlife Resources Agency)

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The Domain of Sewanee: the University of the South contains 5,260.91 hectares (approximately 13,000 acres) of largely unfragmented forests on the Southern Cumberland Plateau in Franklin County, Tennessee. Communities of aquatic headwater fauna (crayfishes, ichthyofauna, and herpetofauna) on the Domain are found in mostly intact habitats with stream connectivity. The Domain has never been cataloged for freshwater faunal diversity until now. In this project, we have provided a checklist of the following headwater fauna: 5 species of crayfish, 25 species of fish, 18 species of salamanders, 14 species of frogs/toads, 6 species of lizards, 5 species of turtles, and 16 species of snakes.

3. Comparing aqueous environmental DNA metabarcoding to sediment-bound environmental DNA metabarcoding in sand-dominated freshwater systems Student Competition**

Eduardo Toala-Hidalgo* (Tennessee Tech University, Department of Biology), Tony Kumetis (Tennessee Tech University, Department of Biology), Robert T. R. Paine (Cooperative Research Fishery Unit, Tennessee Tech University), Kit Wheeler (Tennessee Tech University, Department of Biology), Amanda Rosenberger (U.S. Geological Survey, Cooperative Fishery Research Unit, Tennessee Tech University)

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The study of fish assemblage composition in headwater systems is vital for resource managers, as headwaters supply water, sediments, and nutrients downstream. Further, many fishes are unique to headwater ecosystems and are not typically found downstream, whether that is due to habitat specialization or biotic interactions. Headwater systems are also used by mainstem stream fishes as refugia or spawning habitat. Advances in technology have facilitated the development and use of new molecular sampling methods, such as environmental DNA (eDNA) metabarcoding. eDNA metabarcoding allows for the assessment of fish assemblages through the collection of water or sediment samples from the stream. However, it is still to be determined if data from sediment bound eDNA is comparable to aqueous eDNA, particularly in headwater systems where there are small-bodied species in low abundance. Sediment bound eDNA may be detectable for longer periods of time but may be more localized to the original DNA source, than free-floating aqueous eDNA. Here, we will discuss sampling efforts to compare these two eDNA protocols in Cub Creek, a headwater tributary to the Hatchie River in west Tennessee. Cub Creek is a sand-dominated system that has been historically degraded by logging and agriculture, resulting in channelization, headcutting, incisions, and reduced habitat complexity. All of these may change the effectiveness of eDNA sampling, and the results from our study may be used to inform future sampling designs to evaluate the status and trends in headwater fish assemblages.

4. Spatial and Temporal Water Quality on the Calfkiller River: Effects on Bluemask Darter Reintroduction Student Competition**

Seth Haston* (Tennessee Tech), Justin Murdock (Tennessee Tech)

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The Bluemask Darter (*Etheostoma akatulo*) is a small benthic fish that was originally listed as endangered in 1993 by the United States Fish and Wildlife Service. These darters are endemic to the Upper Caney Fork System within the Cumberland River Drainage in Tennessee. Historically found in the Calfkiller River, Bluemask darters are now restricted to the Caney Fork River, Cane Creek, Rocky River, and Laurel Creek. Several reintroduction attempts have been made in the Calfkiller River, but these have not been successful, and the reasons for these failures is unknown. Previous work has identified suitable habitat is present, but also identified potential water quality issues due to a large quantity of spring water entering the streamat a single location (Twenty Springs) that may be originating from a municipal wastewater plant in the adjacent watershed.The objective of my research is to determine if the spring water is contributing to hypoxia, or other water quality issues that can effect reintroduction. Longitudinal water quality was collected seasonally by floating the upper Calfkiller to identify potential sources of groundwater inflow and its influence on stream water quality. Additionally, continuous measurements of dissolved oxygen are being recorded above and below Twenty Springs to estimate the effect of the spring on stream metabolism and oxygen use. This work will help to better understand how cross watershed water exchange may effect fish restorations in karst dominated areas, and contribute to a more wholistic understanding of successful fish reintroductions.

Session I: Student Symposium

*Indicates presenting author

1. A Quantitative Synthesis Comparing eDNA Metabarcoding and Conventional Sampling of Freshwater Fish Assemblages

Tony Kumetis* (Tennessee Tech University), Kit Wheeler (Tennessee Tech University), Robert T. R. Paine (Cooperative Fishery Research Unit), Amanda E. Rosenberger (U.S. Geological Survey, Cooperative Fishery Research Unit)

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The study of fish assemblage composition is vital for resource managers worldwide, as the knowledge of species both currently and previously present can guide management goals. Completing assemblage-wide sampling allows for the detection of rare and endangered fishes, increased knowledge on the natural systems in question, and the early detection of non-native species that may be harmful or problematic. Conventional aquatic sampling techniques (e.g., electrofishing and seining) are often used to survey fish assemblages; however, technological advances have facilitated the development and use of new molecular sampling approaches. One such approach is environmental DNA (eDNA) metabarcoding, which allows for rapid assemblage assessment. Presently, there is uncertainty about differences in effectiveness between molecular and conventional sampling approaches, and how such differences may be related to instream variables such as low flow conditions and sediment deposition. Here, we present results of a quantitative synthesis of papers comparing eDNA metabarcoding with conventional methods used to sample fish assemblages in freshwater systems. As part of our analysis, we used the Sørensen-Dice Coefficient to compare eDNA metabarcoding and conventional sampling results at sites where both approaches were used. We will compare the percent of the total species pool at each site that was detected by eDNA metabarcoding and conventional sampling. Preliminary results suggest that eDNA metabarcoding results in greater, equal, and reduced levels of species richness when compared with conventional methods in 63%, 5%, and 32% of cases, respectively. Additionally, our synthesis found that eDNA metabarcoding (34% success) outperforms conventional sampling (7%) in detecting the complete species pool. Our results can inform freshwater biodiversity conservation strategies by helping to elucidate generalizable patterns associated with two of the most commonly applied sampling techniques in lotic environments.

2. Evaluation of Striped Bass (*Morone saxatilis*) Seasonal Movements and Predation on Stocked Trout in the Lower Caney Fork River

Dalton Bonds* (Tennessee Tech University), Mark Rogers (U.S. Geological Survey), Robert Paine (Tennessee Tech University)

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Coldwater dam releases create unique downstream habitats that support a variety of stocked and naturally reproducing sportfishes. Rainbow Trout (*Oncorhynchus mykiss*), Brown Trout (*Salmo trutta*), and Brook Trout (*Salvelinus fontinalis*) are stocked into the lower Caney Fork River by the Tennessee Wildlife Resource Agency (TWRA) throughout the year. Landlocked Striped Bass (*Morone saxatilis*) enter the lower Caney Fork through the Cumberland River system. Striped Bass and stocked trout support recreational fisheries within the lower Caney Fork River. Previous studies have documented landlocked Striped Bass in similar systems in the southeastern United States feeding on stocked trout, and sampling efforts conducted by the TWRA have confirmed Striped Bass predation on stocked trout in the lower Caney Fork. However, the seasonal movements and feeding habits of Striped Bass in the lower Caney Fork River are still unknown. The research objectives of this project are to 1) quantify seasonal movements of Striped Bass in the lower Caney Fork River, 2) identify and quantify Striped Bass stomach contents, and 3) investigate the relationship between trout in Striped Bass stomach contents and stocking timing and location. Seasonal movements of Striped Bass will be captured using passive and active telemetry throughout the lower Caney Fork River with surgically implanted transmitters. Striped Bass will be collected for gastric lavage and vent swabbing by boat electrofishing before and after trout stocking events. Stomach contents will be analyzed visually and genetically using quantitative polymerase chain reaction (qPCR). Gastric lavage and acoustic telemetry efforts will occur in tandem to examine the correlation between Striped Bass feeding habits and the TWRA trout stocking regime. Results from this study will inform future trout stocking management decisions and continued Striped Bass management.

3. Using a combination of habitat modeling and environmental DNA surveillance to determine the presence and distribution of critically imperiled, benthic, and cryptic fish

Hannah Swain-Menzel* (Tennessee Cooperative Fishery Research Unit), Robert Paine (Tennessee Cooperative Fishery Research Unit), Amanda Rosenberger (U.S. Geological Survey, Tennessee Cooperative Fishery Research Unit)

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The Southeastern United States is the hotspot for aquatic diversity in the temperate world, with many small and endemic species. Information is limited but needed for many species, particularly those that are threatened and endangered with small distributions. Rapid and sensitive biomonitoring approaches such as molecular surveillance can demarcate the distribution of critically imperiled and cryptic species. Further, remotely-sensed data provides researchers with a means to develop non-intrusive and rapid approaches for habitat assessment, using tools like MaxEnt modelling. The Duskytail Darter (*Etheostomas percnurum*) and Chucky Madtom (*Notorus crypticus*), two rare fishes on the brink, provide opportunities for the application of environmental DNA (eDNA) surveillance combined with habitat modelling to ascertain the current distribution of two rapidly declining, and potentially extirpated species. Here, we aim to develop a more structured approach to extirpation decision making by incorporating current framework with molecular surveillance and remotely-sensed data modelling, thereby allowing managers to identify range decreases or extirpation with measurable confidence. Our objectives are: (1) to develop and use eDNA assays for detection of rare species, (2) develop species distribution models to inform eDNA sampling efforts, (3) and create a framework for an extirpation index. We detected Duskytail Darter eDNA at 8 of 27 sites over four different sampling events. We did not detect Chucky Madtom in any of the 27 sampled sites across two sampling events. Successful development of this project will provide a new approach to surveillance for rare, cryptic species in the southeast United States, and will assist wildlife managers and agencies with decision making tools that can be applied towards allocation of conservation resources.

4. Freshwater Mussels of the Hatchie: Distribution, Composition, and Abundance

Katelynn Sallack*(Tennessee Tech University), Kayla N. Key (West Tennessee River Basin Authority), Kristin Irwin Womble (Tennessee Tech University/Tennessee Cooperative Fishery Unit), and Amanda Rosenberger (Tennessee Tech University/Tennessee Cooperative Fishery Unit)

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Freshwater mussels are amongst the most imperiled faunal groups, but significant data gaps exist regarding their distribution and habitat requirements. In particular, West Tennessee (WT) has few historic mussel records, making conservation and restoration efforts in the area difficult. Further, the region's unique hydrology and habitat conditions have largely been altered by land use changes, channelization, and water control structures such as culverts and impoundments. Efforts in recent decades have attempted to restore streams in WT to a more natural state, but this restoration has not targeted or considered mussel conservation. The Hatchie River, a 238-mile tributary to the Mississippi River, remains one of the least degraded WT Rivers, escaping impoundment and much of the main-channel alteration that has occurred in the area. Historically serving as a home to over 30 species of freshwater mussels, the Hatchie River provides a unique opportunity to study mussel assemblages and to determine what habitats are associated with mussel aggregations in WT rivers without extensive channel alteration. Collaborators from Tennessee Tech University and the West Tennessee River Basin Authority conducted timed qualitative surveys and bank searches throughout three sections of the Hatchie to update the freshwater mussel distributions there. Physical habitat features such as sinuosity, side channel density, and the presence of peripheral habitat were found using remote sensing. Presented here are the findings of that work, including the distribution, composition, and abundance of the current freshwater mussel assemblage for the surveyed sections. Also, the past and current mussel assemblages were compared and mussel habitat associations were determined. Information gathered during these surveys will guide future restoration efforts and identify locations and methods that would most benefit mussels in the WT region.

5. Modeling the effects of increased Paddlefish (Polyodon spathula) fecundity on total population size and growth in Lake Cumberland, Kentucky

Ashley Garrison* (Clemson University)

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For decades, Paddlefish (*Polyodon spathula)* populations have declined due to anthropogenic activity and irregularity within life-history patterns. An assessment on this decline was evaluated using a female only, Lefkovitch matrix model with stochasticity incorporated into the survive and remain adult stage class to assess population size and growth. Results showed that increasing fecundity 10, 15, and 20% had no effect on the population size and growth; rates remained in a 15% decline. Ultimately, future conservation will depend on our ability to apply a broad, interconnected approach to simultaneously mitigate the multiple compromising factors that put species such as the Paddlefish at risk.

6. Mixed Company: The Importance of Interspecies Interactions in Minnow Communities

Christian Swartzbaugh* (University of Georgia Odum School of Ecology; Savannah River Ecology Laboratory; Tennessee Aquarium Conservation Institute), Anna George (Tennessee Aquarium Conservation Institute), Krista Capps (University of Georgia Odum School of Ecology; Savannah River Ecology Laboratory), Stacey Lance (University of Georgia Odum School of Ecology; Savannah River Ecology Laboratory)

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Mixed species groups, where individuals of multiple species preferentially associate together, are a ubiquitous yet understudied component of southeastern aquatic biodiversity. The benefits derived from these associations may play an important role in the stability of aquatic systems and, consequently, be of particular interest to conservation practitioners looking to implement more effective reintroduction strategies. We conducted a study in artificial streams at the Tennessee Aquarium Conservation Institute (TNACI) investigating the influence of mixed groups and predator presence on the condition and behavior of the Tennessee Dace (*Chrosomus tennesseensis*). As a potential positive partner fish, we used the Western Blacknose Dace *(Rhinichthys obtusus*), which occurs sympatrically with the Tennessee Dace, in the presence and absence of a caged invasive predator, the Green Sunfish (*Lepomis cyanellus*). Tennessee Dace from mixed groups (those containing Western Blacknose Dace) had a significantly higher detection probability during observations, potentially indicating an increase in "boldness" bolstered by the presence of the other species. Additionally, differing rates of positive and negative interactions were observed between mixed- and single-species groups. The Tennessee Dace was chosen as a surrogate for the closely related Laurel Dace (*Chrosomus saylori*), a critically endangered minnow and target species for conservation at TNACI. Freshwater reintroduction programs are a critical component in bolstering the populations of threatened species. However, a single-species approach to reintroduction may limit chances of success. By understanding the importance of positive biotic interactions between community members, we can implement more effective programs that harness the power of these interactions to promote the success of reintroduced species.

Session III: Contributed Presentations

*Indicates presenting author

17. The Race to Save the Laurel Dace: A Fish Out of Water

Abbey Holsopple (Tennessee Aquarium Conservation Institute), Geoff Call (United States Fish and Wildlife Service), Sarah Kate Bailey (TNACI), Teresa Israel (TNACI), Bernie Kuhajda* (TNACI), Christian Swartzbaugh (TNACI, University of Georgia), Anna George (TNACI)

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The Laurel Dace, *Chrosomus saylori*, is a federally endangered species endemic to small headwater streams along Walden Ridge, a section of the Cumberland Plateau, Tennessee. Populations of Laurel Dace have faced rapid declines in the past decade. Threats to the Laurel Dace include poor agricultural practices leading to heavy siltation and declining water quality, competition and predation from invasive sunfishes and basses, high levels of infection from Yellow Grub disease (a trematode), and drought. Laurel Dace were historically found in eight streams, but are now common in only two streams, Bumbee Creek and Youngs Creek. In 2016, a severe drought was thought to cause extirpation of the Laurel Dace from one of the stronghold populations in Moccasin Creek. This summer, Walden Ridge experienced extreme prolonged drought beginning in early July that led to drying of the two remaining streams with Laurel Dace. Working with the U.S. Fish and Wildlife Service, we began an emergency response to rescue Laurel Dace from these drying streams to prevent further extirpation and potential extinction. We successfully relocated 298 Laurel Dace from the streams to our care. These are currently spread between three facilities (two at the Tennessee Aquarium and one at the Wolf Creek National Fish Hatchery), where they will be held until drought conditions improve. We hope to release these fish back into the wild this winter but have also begun planning the next steps necessary for long-term recovery of this species including range-wide surveys, establishing an ark population, determining the source of trematode-infected snails (first intermediate host), and beginning a reintroduction program with the appropriate genetic monitoring.

18. Working toward the recovery of the Pale Lilliput (*Toxolasma cylindrellus*)

Kristin Womble* (Tennessee Tech University), Amanda Rosenberger (U.S. Geological Survey), Robert Paine (Tennessee Tech University)

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The Pale Lilliput (*Toxolasma cylindrellus*) is a federally endangered freshwater mussel that is restricted to two natural populations in the Tennessee River drainage. Past surveys of the Pale Lilliput were conducted without current understanding of its short-term brooding life history or burrowing behaviors, and these surveys likely under-sampled areas where the species would be attracting its Fundulus hosts (i.e., shallow stream margins). Propagation has resulted in reintroductions of the species in several locations; however, targeted surveys to discover new Pale Lilliput populations in the species' historical range have not occurred on a large scale. The objective of this project was to use combined methods of habitat modeling, field surveys, and environmental DNA to assess the current status and distribution of the Pale Lilliput to inform recovery. Our MaxEnt model (Test AUC=0.92, Omission rate=0.17) identified areas with higher forest cover extent, low mean annual flows, moderate stream gradients, low nitrogen fertilizer application rates and road densities, and higher mean summer stream temperatures as suitable for the Pale Lilliput. We used our model results to select sites for targeted field surveys, and we surveyed 22 sites throughout 14 streams in 2023 and 2024. While we did not observe Pale Lilliputs in the field, we identified Crow Creek and Richland Creek as potential reintroduction sites for the species. Since the Pale Lilliput is often difficult to detect in field surveys, we selected six sites for eDNA sample collection, focusing on sites most likely to harbor the species. This study assists the recovery of the Pale Lilliput by informing future establishment of a new population and assesses the utility of combining habitat modeling, field surveys, and eDNA for rare species conservation.

19. Conservation Fisheries, Inc: Past, Present, and Future of Freshwater Conservation in the Southeastern United States

Shannon Murphy* (Conservation Fisheries, Inc.)

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Conservation Fisheries, Inc. (CFI) started as a graduate student project in the 1980's and has grown to become a pillar in freshwater conservation in not only Tennessee but throughout the southeastern United States. To date, they have worked with over 85 species of non-game fishes and partner with state, federal, and non-government organizations to restore ailing or extirpated populations of these fishes. CFI has expanded from performing propagation and field work to include education and outreach for students, professionals, and community members. Looking ahead, CFI has a vision for project expansions, increased community presence, and updated infrastructure to support these conservation efforts.

20. Lake Sturgeon Recovery Efforts in the Southeast United States: Where are we after Two-Decades of Restoration?

Brandon Simcox* (TWRA), Sarah Kate Bailey (TNACI), John Damer (GWRD), Michael Fulghum (USFWS), Teresa Israel (TNACI), Bernie Kuhajda (TNACI), David Mathews (TVA), Matt Thomas (KYDFW), Nathan Whelan (USFWS)

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The abundance of Lake Sturgeon decreased range wide throughout the mid-1900's due to dam construction, water pollution, and over-fishing. Populations in the Southeastern United States were functionally extirpated by the 1980's with the last reported mature Lake Sturgeon collected by biologists below Cordell Hull Reservoir, TN in 1978. Water quality improvements following the Clean Water Act and enhancements to water releases downstream of hydroelectric facilities made it possible to consider the reintroduction of Lake Sturgeon. Reintroduction efforts in the Southeast began in 1998 with the formation of a partnership of state and federal agencies, non-profit organizations, and universities. The mission of this partnership was outlined in a comprehensive Management Plan with the primary goal of restoring a self-sustaining population of Lake Sturgeon back to their native range within the Coosa, Cumberland, and Tennessee river basins. Since the late 1990s, this partnership has collaborated annually with the Wisconsin Department of Natural Resources to harvest eggs and sperm from Lake Sturgeon spawning runs in the Wisconsin and Wolf Rivers. To date, approximately 700,000 Lake Sturgeon have been stocked into rivers in Georgia, Kentucky, North Carolina, and Tennessee. Through targeted monitoring efforts, Lake Sturgeon from all stocked year classes have been documented throughout the restoration area. Mature male Lake Sturgeon have been confirmed in the Coosa, Cumberland, and Tennessee rivers and mature female Lake Sturgeon have been confirmed in the Coosa River in Georgia. Natural reproduction has not been confirmed in the Tennessee and Cumberland rivers, however graduate students from the University of Georgia recently documented natural recruitment to the juvenile stage in the Coosa River. Due to the ongoing conservation and management efforts in the Southeast, Lake Sturgeon populations have been brought back from extirpation and are trending towards restoration goals.

Session IV: Contributed Presentations

*Indicates presenting author

21. Avian Predation on Rainbow Trout in a Tennessee Tailwater Fishery

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Recent increases in colonial-nesting waterbird populations, specifically Double Crested Cormorants, *Phalacrocorax auritus*, and Great Blue Herons, *Ardea herodias*, have led to angler conflicts and potential negative effects on fisheries. Avian piscivores often congregate near heavily stocked trout fisheries, taking advantage of naïve hatchery trout. No study, to our knowledge, has evaluated avian predation of Rainbow Trout in the southeastern United States using individually marked Rainbow Trout. Over a 4-year period we PIT tagged 3,219 Rainbow Trout, *Oncorhynchus mykiss*, of hatchery and wild origin across 20 km of the Norris tailwater in east Tennessee. We then searched for PIT tags in the only colonial nesting site observed in the study area and detected 124 of the deployed PIT tags. Avian predation rates were significantly higher for hatchery Rainbow Trout than wild Rainbow Trout; minimum avian predation rates over the duration of the study were 3.23%, 9.96%, and 3.85% for wild, hatchery, and combined Rainbow Trout groups respectively. True predation rates are presumably higher and could represent a large source of Rainbow Trout mortality in the Norris tailwater and other fisheries where avian piscivores are abundant. We also found that Rainbow Trout size did not appear to limit avian predation, so stocking larger Rainbow Trout may not reduce avian predation risk. Understanding how avian predation impacts sport fisheries can inform mitigation for this potentially underestimated source of mortality.

22. West TN Mussel Restoration Planning

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The southeast of the US holds the most diversity of freshwater mussels in the world, which is also one of the most imperiled faunal groups with approximately 70% of North American mussel species being either endangered, threatened, or of special concern. Freshwater mussel populations are monitored and studied by several federal, state, and educational entities in the state of Tennessee. Despite these efforts, we face a paucity of freshwater mussel records from streams in West Tennessee, particularly those in the Mississippi drainage. These knowledge gaps inhibit conservation of species and limit the utility of habitat restoration for improving mussel populations. Further, hydrological and habitat conditions of these western-flowing rivers contrast from their Eastern counterpoints, limiting the utility of transferring our knowledge from these systems to direct management or restoration action to conserve these mussel species. The western flowing streams of WT, with exception of mainstem Hatchie River, have suffered widespread degradation due to land use change and channelization which shortened streams by 44%, lowered bed elevation by 170%, and increased stream gradient by 600% (Hupp et al. 2009). The impacts led to habitat loss, fragmentation, and species loss and isolated populations. Within recent decades, restoration efforts in WT have attempted to restore stream and floodplain function and connection to a more natural state and provide functional lift to many stream systems. As habitat conditions improve, managers and partners are working together to identify a path forward for freshwater mussel recovery and restoration in west TN. In this presentation, I will discuss current conditions, partnerships, and plans for restoring freshwater mussel populations in the western portion of the state.

23. Region 1 Habitat Update

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The Region 1 fisheries crew have multiple habitat projects including rehabilitation of the Birdsong fishing pier, a collaborative project with the Boy Scouts of America, and habitat enhancements for Largemouth Bass in Kentucky Reservoir. The Birdsong fishing pier is a popular fishing pier in Benton County on Kentucky Reservoir that was deteriorating. Region 1 fisheries crews replaced the walkway and side railing with synthetic decking to increase safety and longevity of the pier. Region 1 fisheries crews also collaborated with the Boy Scouts of America to complete an eagle scout project focused on deep water habitat enhancement, resulting in 60 artificial trees which will be placed in various locations within Kentucky Reservoir. Friends of Reservoirs in partnership with Beyond the Pond also awarded Region 1 habitat crew with a grant focused on enhancing spawning and sanctuary habitat for Largemouth Bass in Kentucky Reservoir.

24. Aquatic Connectivity Activities for the Recovery of the Slackwater Darter

Shawna Fix* (Southeast Aquatic Resources Partnership), Todd Ewing (Southeast Aquatic Resources Partnership), Emily Granstaff (U.S. Fish & Wildlife Service), Robert Cogburn (U.S. Fish & Wildlife Service), Kathleen Hoenke (Southeast Aquatic Resources Partnership), Richard Campbell (U.S. Fish & Wildlife Service)

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The Slackwater Darter (*Etheostoma boschungi*) is a federally threatened fish found in the middle Tennessee River drainage in Alabama and Tennessee. Two of the major reasons for the decline of the Slackwater Darter are habitat degradation, in the form of excessive sedimentation, and habitat fragmentation due to dams and road-stream crossings. As a first step to prioritize conservation actions to facilitate recovery of this species, we assessed over 1000 road-stream crossings to determine the extent they act as barriers to aquatic organism passage. We then conducted an action assessment to identify areas in need of restoration. Biologists from the US Fish and Wildlife Service, the Southeast Aquatic Resources Partnership, the Tennessee Wildlife Resources Agency, the Alabama Department of Conservation and Natural Resources' Wildlife and Freshwater Fisheries Division, and other partners then prioritized habitat restoration activities for the Slackwater Darter. Implementation of these projects are currently ongoing.