American Fisheries Society

2022 Arkansas Chapter Meeting

February 23-25, 2022

Graduate Hotel
Fayetteville, Arkansas

Arkansas Chapter of the American Fisheries Society

Executive Committee – 2021-2022

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February 23, 2022

Dear Chapter Members,

Welcome to the 36th Annual Meeting of the Arkansas Chapter of the American Fisheries Society. We hope you are able to make full use of this opportunity to reconnect with your fisheries colleagues from around the state, network with new ones, and learn about the excellent aquatic research that is occurring throughout Arkansas. It is a reminder that our duty as professionals is to always be learning. We truly are all students!

It amazes me that it has been 3 years since the Chapter last met in person. While connections were made, we then found ourselves in the whirlwind of hosting the 2020 Southern Division AFS meeting and little time to build relationships with members of our own Chapter. So for this meeting, the Executive Committee wants to slow things down, try some new things, and focus on making connections and supporting each other as colleagues. We have the perfect setting for building connections, with the Fayetteville Square and Dickson Street just a short walking distance from the hotel. There you will have your choice of locally-owned coffee shops, restaurants, and bars to enjoy. So, sit back and relax with new, or old, friends and build connections that will help serve conservation for years to come.

Thank you for coming to Fayetteville and supporting our Chapter. We hope you have a great experience!

JJ Gladden
President, Arkansas Chapter AFS

February 23, 2022

Dear Colleagues and Friends:

On behalf of the Chapter's Executive Committee and organizing members, welcome to the 36th annual meeting of the Arkansas Chapter of the American Fisheries Society (AFS). We have worked diligently at planning the meeting, which we hope you find meaningful, informative, and entertaining. We are very happy to be hosting the conference in Fayetteville at the Graduate Hotel. The hotel brims with local and unique charm and served as the inspiration for our Chapter meeting theme: "We are all students".

The goal of the Executive Committee was to host a meeting where interactions between professionals and students are encouraged and strengthened. This year's Arkansas Chapter AFS meeting promises to be among the best, with 31 oral presentations, 13 posters, a crayfish identification workshop, and a student workshop. We hope the conference will be beneficial and well worth your trip to Fayetteville. Please enjoy the conference, and feel free to ask for anything you might need.

Thank you,

Christy Graham
Conference Program Chair
President-Elect, Arkansas Chapter AFS

AMERICAN FISHERIES SOCIETY
MEETING CODE OF CONDUCT

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Purpose of the Code of Conduct:

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Consequences of Unacceptable Behavior:

Anyone requested to stop unacceptable behavior is expected to comply immediately. Consequences may include one or more of the following actions:

- Dismissal from the meeting without refund;
- Reporting to your agency;
- Exclusion from future AFS meetings for five years;
- Revoke AFS membership without the opportunity for renewal for five years;
- If the offense is criminal, local law enforcement will be contacted.

Program Overview

American Fisheries Society

36th Annual Meeting of the Arkansas Chapter American Fisheries Society

Graduate Hotel, Fayetteville, Arkansas

Wednesday, February 23rd

Activity	Time	Location*
Crayfish Workshop	8:30 am - 12:00 pm	AGFC J.B. and Johnelle Hunt Nature Center
Lunch- On Your Own		
Meeting Registration	11:00 am - 1:20 pm	Brodie Payne Rooms Foyer
Presentation Loading	12:00 pm - 1:20 pm	Brodie Payne Rooms Foyer
President's Welcome	1:20 pm - 1:30 pm	Brodie Payne Room BCD
Keynote Address	1:30 pm - 2:00 pm	Brodie Payne Room BCD
Session I	2:00 pm - 3:15 pm	Brodie Payne Room BCD
Break	3:15 pm - 3:30 pm	Brodie Payne Room A
Session II	3:30 pm - 4:45 pm	Brodie Payne Room BCD
Poster Session	5:30 pm - 7:00 pm	Brodie Payne Room A
Scavenger Hunt	6:15 pm - ????	Participate to Find Out!

Thursday, February 24th

Activity	Time	Location
Meeting Registration	7:30 am - 8:30 am	Brodie Payne Rooms Foyer
Presentation Loading	7:30 am - 8:30 am	Brodie Payne Rooms Foyer
Session III	8:30 am - 9:45 am	Brodie Payne Room BCD
Break	9:45 am - 10:00 am	Brodie Payne Room A
Session IV	10:00 am - 11:30 am	Brodie Payne Room BCD
Lunch- On Your Own	11:30 am - 1:30 pm	
Student Workshop	11:45 am - 1:00 pm	Brodie Payne Room A
Session V	1:30 pm - 2:45 pm	Brodie Payne Room BCD
Break	2:45 pm - 3:15 pm	Brodie Payne Room A
Session VI	3:15 pm - 4:30 pm	Brodie Payne Room BCD
Banquet/Silent Auction	6:00 pm - 9:00 pm	Brodie Payne Room ABCD

Friday, February 25th

Activity	Time	Location
Chapter Business Meeting	9:00 am - 11:00 am	Brodie Payne Room ABCD
Past President's Luncheon	11:45 am - 1:00 pm	Cheers OPO (invitation only)

**Brodie Payne Rooms are located in the Graduate-Fayetteville Hotel*

Oral Presentation Schedule

(See pages 15-31 for complete abstracts in presentation order)

Wednesday, February 23rd

Time	
1:20 PM	**President's Welcome** *by* JJ Gladden
1:30 PM	**Keynote Address: "We Are All Students"** *by* Dr. Steve Lochmann

Session I: Graduate Student Oral Presentations Part I

Moderator: Jon Stein, Arkansas Game and Fish Commission

Time (Order)	**Presentation Name and Author(s)** ***** = *Presenter*
2:00 PM (1)	**Population Dynamics of Silver Carp *Hypophthalmichthys molitrix* Within the Lower Mississippi River Basin.** Cooper E. Barshinger*, Jeff J. Stevens, Jonathan J. Spurgeon, Steve E. Lochmann, and Michael A. Eggleton
2:15 PM (2)	**Comparison of Two Otolith Processing Methods for Age Estimation of Silver Carp Within the Lower Mississippi River Basin.** Jeff N. Stevens*, Cooper E. Barshinger, Jonathan J. Spurgeon, Michael A. Eggleton, and Steve E. Lochmann
2:30 PM (3)	**Paleback Darter Seasonal Occupancy in Main Channel and Off-channel areas of Lick Creek in the Ouachita Mountain Ecoregion in west-central Arkansas** Katie Morris*, Steve Lochmann, Jonathan Spurgeon, Dustin Lynch, and Mitzi Cole
2:45 PM (4)	**Why We Should Care About Examining Barriers to Outdoor Recreation, Hunting and Recreational Fishing Participation Among Minority Populations.** Annette D. Williams Fields* and Steve E. Lochmann
3:00 PM (5)	**Small-Scale Movement Rates, Linear Home Range, and Habitat Selection by Invasive Silver Carp *Hypophthalmichthys molitrix* in Two Rivers of Central Arkansas.** Andrew L. Althoff* and Steve E. Lochmann
3:15 PM	**BREAK**

Session II: Graduate Student Oral Presentations Part II

Moderator: Nicholas Feltz, Arkansas Game and Fish Commission

Time (Order)	**Presentation Name and Author(s)** ***** = *Presenter*
3:30 PM (6)	**Effects of a Highly Modified Flow Regime on the Fish Assemblage of Mid-Sized River.** Aaron G. Gray* and Scott F. Collins
3:45 PM (7)	**Fish Assemblage Patterns Across the South Central Plains of Arkansas: A Preliminary Analysis.** Ryne Lehman*, Molly Wozniak, Hal Halvorson, Ginny Adams, and Reid Adams
4:00 PM (8)	**Assessment of Lower Mississippi River Fish Assemblages During Pre- and Post-Establishment of Invasive Silver Carp *Hypophthalmichthys molitrix*.** Glen C. Jackson*, Cooper E. Barshinger, Derek K. Owens, and Michael A. Eggleton
4:15 PM (9)	**An Evaluation of Drone Imagery and Supervised Classification to Identify and Quantify Vegetation in Arkansas Reservoirs.** Jamie Kindschuh*, Steve Lochmann, and Jonathan Spurgeon
4:30 PM (10)	**Temporal and Spatial Distribution of Brown Trout Redds on the Greers Ferry Tailwater.** Derek Owens* and Steve Lochmann
5:30 PM	**Poster Session**

Thursday, February 24th: Professional Oral Presentations

Session III: Non-Game Fish; Fish Habitat
Moderator: Brie Olsen, Arkansas Department of Energy & Environment

Time (Order)	Presentation Name and Author(s) * = *Presenter*
8:30 AM (11)	**More fish swim to more places (and mussels and crayfish and stuff) – what's been happening in the Arkansas Stream Heritage Partnership.** Darrell Bowman*, Eric Brinkman, Tate Wentz, Whit Montegue, Jeff Fore, Kayti Ewing, Chris Davidson, Matt Anderson, Leif Kindberg, Kat Hoenke, and Victoria Ruddle
8:45 AM (12)	**Initial Fish Response to Bypassing of a Low–Water Crossing Barrier on a Tributary to the Kings River.** Chance Garrett*, Ginny Adams, and Reid Adams
9:00 AM (13)	**Distribution and Status of Mussels in the Louisiana Portion of the Bayou Bartholomew Drainage.** Kyler B. Hecke*, Gus C. Engman, and Gerry R. Dinkins
9:15 AM (14)	**Rapid Urbanization and Development Poses Threats to Two Rare Fishes in Northwest Arkansas.** Justin A. Stroman*
9:30 AM (15)	**Enhancement of Beaver Lake Fish Habitat: It's All About the Partnerships!** Jon Stein*, Eric Gates, and Jordan Lindaman
9:45 AM	**BREAK**

Session IV: Fish Habitat

Moderator: Chad Wicker, Arkansas Game and Fish Commission

Time (Order)	**Presentation Name and Author(s)** ***** = *Presenter*
10:00 AM (16)	**Quantifying Spatial and Temporal Changes in Riverine Habitat Using Hydroacoustics and Simple Predictive Models.** Ryan A. Gary* and James M. Long
10:15 AM (17)	**Land cover and water quality within the Spring River basin** Joseph E. Kaiser*, Christy Graham, Ryan Gary, Tim Burnley, and Eli Powers
10:30 AM (18)	**Development of a Cooperative Water Temperature Monitoring Program for Arkansas.** Jeffrey W. Quinn*
10:45 AM (19)	**The Lake Monticello Renovation Project** Kristofor N. Nault* and Tyler C. Thomsen
11:00 AM (20)	**Fourth-Corner Analysis for Stream Fishes** Maxwell L. Hartman*, Katie M. Morris, and Steve E. Lochmann
11:15 AM (21)	**Lake DeGray Vegetation Re-Establishment Project – Vegetation Mapping Update** Scott Jones*
11:30 AM	**LUNCH- On Your Own**
11:45 AM	**Student Workshop**

Session V: Science Communication; Fisheries Management and Techniques
Moderator: Ryan Gary, Arkansas Game and Fish Commission

Time (Order)	**Presentation Name and Author(s)** ***** = *Presenter*
1:30 PM (22)	**Science Communication: An Alternative Viewpoint** Jason Olive*
1:45 PM (23)	**Sharing Your Science** Jessica Feltz*
2:00 PM (24)	**Family and Community Fishing Program: A Recruitment, Retention, and Reactivation (R-3) approach to the outdoors in Arkansas during the Pandemic.** Maurice Jackson*
2:15 PM (25)	**Rainbow Trout Delayed Mortality in Bull Shoals and Norfork Tailwaters** Hae H. Kim*, Connor Cunningham, Christy L. Graham, and Quinton E. Phelps
2:30 PM (26)	**Novel Approach to Utilizing Remote Cameras in Estimating Fishing Effort: Maximizing Efficiency.** Nicholas G. Feltz*
2:45 PM	**BREAK**

Session VI: Fisheries Management and Techniques

Moderator: Tim Burnley, Arkansas Game and Fish Commission

Time (Order)	**Presentation Name and Author(s)** ***** = *Presenter*
3:15 PM (27)	**Spatial Patterns of Florida Largemouth Bass Genetic Introgression into a Northern Largemouth Bass Population after Stocking.** Sean C. Lusk*, Christopher R. Middaugh, Cody Massery, and Allison Asher
3:30 PM (28)	**Evaluation of lake-wide population characteristic differences between the Northern Largemouth Bass and its Backcross following Florida Bass stocking in a large reservoir.** Christopher R. Middaugh*, Sean C. Lusk, and Allison Asher
3:45 PM (29)	**A Comparison of Two Low-Frequency Electrofishing Waveforms on Capture Efficiency and Length Distribution of Flathead Catfish in Felsenthal Reservoir, Arkansas.** Jacob H. Martin*
4:00 PM (30)	**Hypoxia Related Mortality of Striped Bass in Norfork Lake.** Quinton E. Phelps*, Hae H. Kim, Alex C. Beezel, and Jeremy Risley
4:15 PM (31)	**Summary of Arkansas Game and Fish Commission Fish Aging Assessment and Discussion of Future Efforts.** Nicholas Feltz*, Allison Asher, Vic DiCenzo, Sean Lusk, Christopher Middaugh, and Jeremy Risley
6:00 PM	**Banquet/Silent Auction**

Poster Session Overview

(See pages 32-38 for complete poster abstracts, in order)

Undergraduate Student Posters

Order	Poster Name and Author(s) * = *Presenter*
P-1	**Does Diet of *Luxilus pilsbryi* Vary in Response to Stream Drying?** Rebeka Bradford*, Sahara Morgan, Jessica Rath, Chance Garrett, Ginny Adams, and Reid Adams
P-2	**Weight-Length Relationships of Bluegill *Lepomis macrochirus* and Largemouth Bass *Micropterus salmoides* Across Aquatic Habitats.** Ethan Dodson*, Ben Johnson, Blake Coulter, Gunner Gilbert, and Susan Colvin
P-3	**Urbanization of the Arkansas River Valley leads to decreases in species richness and altered trophic patterns.** Ellie Green*, Hunter Hensley, Tanner Brunt, Nicole Carlisle, Zach Sartain, and Susan Colvin
P-4	**Effects of Water Body Size and Habitat Characteristics on Species Richness and Weight/Length of Fish Sampled From Locations.** Ryan Mozisek*, Sydney Hallum, Braden Binns, Michael Schraeder, and Susan Colvin
P-5	**Comparison of Field Acclimatization and Lab Acclimation Approaches to Measuring Fish Thermal Tolerance**. Cade Richesin*, Canyon Vickers, Matthew Gifford, Ginny Adams, and Reid Adams
P-6	**Fish Response to Rainfall and Temperature Data in the Arkansas River Watershed.** Trey Coulter, Autumn Henry, Fischer Sharp*, John Walsh, and Susan Colvin

Graduate Student Posters

Order	Poster Name and Author(s) * = *Presenter*
P-7	**Environmental Gradients Influence Cohabitation and Body Condition of *Lepomis marginatus* and *Lepomis megalotis.*** Parker Brannon*, Ryne Lehman, Ginny Adams, and Reid Adams
P-8	**Seasonal flow variability influences density-dependent interactions of a headwater stream fish.** Seth A. Drake*, Joshua R. Ennen, Kristen K. Cecala, Shawna M. Fix, and Jon M. Davenport
P-9	**Variation in Fish Communities of Boston Mountain Streams in the Ozark National Forest.** Jackson Pav*, Ginny Adams, and Reid Adams
P-10	**Fish Radiological Sampling in Lake Dardanelle, Arkansas** Anthony Zenga*, Dawson Hicks, and Susan Colvin

Professional Posters

Order	Poster Name and Author(s) * = *Presenter*
P-11	**Summary of 2021 Small Impoundment Extension Cases.** Scott Jones*
P-12	**Proposed Standard Weight (Ws) Equation and Length-Categorization Standards for Brown Trout Salmo trutta in Tailwater Systems.** Hae H. Kim*, Connor Cunningham, Christy L. Graham, and Quinton E. Phelps
P-13	**Development of a Predictive Stream-barrier Model in the Ouachita Mountain Ecoregion in West-central Arkansas.** Reagan Spinelli*, Katie Morris, Steve Lochmann, Jonathan Spurgeon, Dustin Lynch, and Mitzi Cole

Oral Presentation Abstracts

(1) Population Dynamics of Silver Carp *Hypophthalmichthys molitrix* Within the Lower Mississippi River Basin.

Cooper E. Barshinger[1]*, Jeff J. Stevens[1], Jonathan J. Spurgeon[2], Steve E. Lochmann[1], and Michael A. Eggleton[1]
[1]University of Arkansas at Pine Bluff, Department of Aquaculture and Fisheries, Pine Bluff, AR
[2] U.S. Geological Survey – Nebraska Cooperative Fish and Wildlife Research Unit, School of Natural Resources, University of Nebraska-Lincoln, Lincoln, NE
barshic0571@uapb.edu.

Invasive carps have steadily increased and expanded throughout the Mississippi River basin since the 1980s. This study aimed to quantify basic population parameters for Silver Carp *Hypophthalmichthys molitrix* from the lower Mississippi River (LMR) basin. Study rivers included the lower Mississippi, Arkansas, White, Cache, and St. Francis rivers in eastern Arkansas. A total of 552 Silver Carp were collected across the five rivers by boat-mounted electrofishing during 2019-2020, with a minimum of 100 specimens per river used for analysis. Populations from all rivers were in excellent condition, with 83% and 45% of fish collected having W_r values exceeding 90 and 100, respectively. With respect to total length, the Arkansas River population contained the largest size distribution (PSD_T = 29%) and greatest mean size (856 ± SD = 104 mm). Mean total lengths in the Arkansas River ranged 50-140 mm greater on average than all other rivers except the Cache. Age structures among rivers were highly similar. Although 90% of all specimens collected were 5-12 years old, populations ranged in age from 3 to 15 years overall. Only 8% of specimens collected were less than age 5, with no specimens collected younger than age 3. Carp growth was found to be similar across all rivers except the Arkansas River, where mean size and von Bertalanffy L_∞ were significantly greater compared to other rivers. Total annual mortality estimates from catch curves ranged 12-36% and averaged 28% (± 9%) across rivers. Recruitment variability index values indicated moderately stable Silver Carp recruitment across all rivers (range 0.353-0.552). Although most among-river differences may not have been biologically significant for Silver Carp populations, it is plausible that some observed differences might be attributable to different anthropogenic and/or environmental stressors. Continuation of this and similar studies will further our understanding of Silver Carp ecology in the LMR basin. Future research should emphasize effects on native fish assemblages and how populations could be interacting among systems.

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(2) Comparison of Two Otolith Processing Methods for Age Estimation of Silver Carp Within the Lower Mississippi River Basin.

Jeff N. Stevens[1]*, Cooper E. Barshinger[1], Jonathan J. Spurgeon[2], Michael A. Eggleton[1], and Steve E. Lochmann[1]
[1]University of Arkansas at Pine Bluff, Department of Aquaculture and Fisheries, Pine Bluff, AR
[2] U.S. Geological Survey - Nebraska Cooperative Fish and Wildlife Research Unit, School of Natural Resources, University of Nebraska, Lincoln, NE
stevenj2398@uapb.edu

Accurate age estimates are critical in the development, implementation, and assessment of Silver Carp *Hypophthalmichthys molitrix* management plans. Lapilli otoliths are the most commonly used hard structures for Silver Carp age estimation, though data regarding the precision of two established preparation methods (i.e., grind-and-burn, thin-section) are lacking. As such, we assessed within-reader, between-reader, and between-method precision for Silver Carp collected in six rivers across the Lower Mississippi River Basin *(*Arkansas, Cache, lower Mississippi, St. Francis, White, and Yazoo). Additionally, we compared the effort and costs associated with each method. In 2019, Silver Carp were collected across the six study rivers using daytime, boat-mounted electrofishing (N=125). To examine within-reader precision, two independent readers twice estimated age for each otolith without knowledge of fish length or ages previously assigned by themselves or the other reader. To maintain independence, samples were randomized and neither reader assigned both ages on the same day. These age estimates were averaged by reader to examine between-reader precision. To examine between-method precision, a concert read was held to determine agreeable age without knowledge of the paired estimate from the other treatment or fish length. Overall, the grind-and-burn method resulted in younger estimated ages than the thin-section method, particularly at older ages. The thin-section method displayed greater between-reader precision than the grind-and-burn method, but age-bias plots revealed lower precision at older ages relative to younger ages. This discrepancy between methods may be a result of misidentification of annuli near the otolith margin as both readers reported that sectioned otoliths offered clearer views than ground otoliths. Processing times and material costs were similar for the two methods. The use of the thin-section method for Silver Carp age estimation may lead to less biased age estimates for established populations with greater abundances of older individuals.

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(3) Paleback Darter Seasonal Occupancy in Main Channel and Off-channel areas of Lick Creek in the Ouachita Mountain Ecoregion in west-central Arkansas

Katie Morris[1]*, Steve Lochmann[1], Jonathan Spurgeon[2], Dustin Lynch[3], and Mitzi Cole[4]
[1]University of Arkansas at Pine Bluff, Department of Aquaculture and Fisheries, Pine Bluff, AR; [2]U.S. Geological Survey—Nebraska Cooperative Fish and Wildlife Research Unit; and University of Nebraska-Lincoln, School of Natural Resources, Lincoln, NE; [3]Arkansas Natural Heritage Commission, Little Rock, AR; [4]U.S. Forest Service, Hot Springs, AR; morrisk3140@uapb.edu

Paleback Darter *Etheostoma pallididorsum* is endemic to the Ouachita Mountains in west-central Arkansas. Previous research suggests that Paleback Darter is an obligatory spring spawner. Understanding life history requirements of this species may provide insight into its status within its limited range. Limited information is known regarding characteristics of off-channel habitat used by Paleback Darter and how use of off-channel habitats changes seasonally. Our objective was to quantify habitat characteristics associated with seasonal occupancy of off-channel areas by Paleback Darter. We used a multi-season occupancy model to quantify habitat characteristics associated with seasonal occupancy of Paleback Darter. We georeferenced off-channel habitats along the entire length of Lick Creek in Norman, Arkansas. We used stratified random sampling to select main-channel sites and off-channel sites. We used 30 off-channel sites and 30 main-channel sites to assess changes in seasonal occupancy along the length of Lick Creek. We sampled these sites two times during the summer season (July-September 2021) and two times during the winter season (January-February 2022). Naïve occupancy estimates suggested changes in seasonal use of off-channel and main channel sites by Paleback Darter. Habitat characteristics of off-channel and main-channel sites may influence the distribution of Paleback Darter along the longitudinal and lateral gradients of streams.

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(4) Why We Should Care About Examining Barriers to Outdoor Recreation, Hunting and Recreational Fishing Participation Among Minority Populations.

Annette D. Williams Fields* and Steve E. Lochmann
University of Arkansas at Pine Bluff, Department of Aquaculture and Fisheries, Pine Bluff, AR
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Recent declines in the participation rate of licensed freshwater anglers and rate of participation in outdoor recreation have underscored the importance of understanding changing demographics in the United States and how that change affects fishing participation. Ethnic minorities and other marginalized groups perceive more constraints to outdoor recreation than their counterparts. Moreover, African Americans are more constrained from outdoor recreation than others. Constraints identified by African Americans include inadequate information, feeling unwelcome, personal safety, and fear of natural settings. Lack of minority participation in outdoor recreation is an indicator of a widening gap between demographics of outdoor recreation participants and the public. We are partnering with the Arkansas Game and Fish Commission to evaluate whether the race of the facilitator relative to the race of most participants determines outcomes during natural resource programming. We plan to use Trout Fishing Clinics to evaluate whether outcomes are improved when there is a match between the racial composition of the audience and the race of a facilitator. Information from this work might guide agency decisions regarding programs targeted at recruiting and retaining minorities. It is our hope that the information from this research be used to build partnerships between natural resource agencies and minority populations.

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(5) Small-Scale Movement Rates, Linear Home Range, and Habitat Selection by Invasive Silver Carp *Hypophthalmichthys molitrix* in Two Rivers of Central Arkansas.

Andrew L. Althoff* and Steve E. Lochmann
University of Arkansas at Pine Bluff, Department of Aquaculture and Fisheries, Pine Bluff, AR
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Silver Carp *Hypophthalmichthys molitrix* is classified as an "injurious" species by the U.S. Fish and Wildlife Service due to the species' tendency to vacate the water when disturbed. Thus, many studies have looked at movements and habitat usage of this species as it has expanded its invasive range, but studies of the Lower Mississippi River basin are few in number. We evaluated daily movement rates, linear home ranges, and macrohabitat use of Silver Carp through radio telemetry in the heavily-impounded lower Arkansas River and free-flowing lower White River. Hourly movement rates and linear home ranges were greater in the White River. Movement rates did not significantly differ between day and night. Macrohabitat use was tested for goodness of fit with null hypotheses that use was equal between habitat types and that use was proportional to the availability of habitat types. Fish in both rivers used certain macrohabitat types more frequently than others.

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(6) **Effects of a Highly Modified Flow Regime on the Fish Assemblage of Mid-Sized River.**

Aaron G. Gray* and Scott F. Collins
Texas Tech University, Department of Natural Resources Management, Lubbock TX 79409
aaron.g.gray@ttu.edu

Mid-sized rivers are often understudied when compared with large rivers and small streams. These systems are often highly modified through the construction of dams and the regulation of flows, which may result in restructured fish communities. In this study, we sampled a 72-km segment of the Lower Sulphur River (Texas, Arkansas) using pulsed-DC boat electrofishing from May to November 2021. The U.S. Army Corps of Engineers heavily regulates the Lower Sulphur River's hydrology, causing dramatic shifts between baseflow (<200 CFS) and flood stages (>10,000 CFS). During our sampling, three months were artificially at flood stage, and then flows were abruptly reduced to baseflow for four months. Using non-metric multidimensional scaling (NMDS), we found that the altered flow regime significantly altered the river's fish assemblage both spatially and temporally. During flooding, we most commonly encountered Bigmouth Buffalo, a large-bodied planktivore. Flathead Catfish, Blue Catfish, and Black Crappie were encountered almost exclusively in baseflow conditions, whereas Largemouth Bass, River Carpsucker, and White Bass were frequently collected across both hydrologic conditions. Altered flow regimes dramatically altered the composition of the riverine fish assemblage. A greater understanding of how fishes adapt to altered flows is essential for effective monitoring and management of river fishes.

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(7) Fish Assemblage Patterns Across the South Central Plains of Arkansas: A Preliminary Analysis.

Ryne Lehman*, Molly Wozniak, Hal Halvorson, Ginny Adams, and Reid Adams
University of Central Arkansas, Department of Biology, Conway, AR
rlehman@cub.uca.edu

Anthropogenic land use alterations can have negative impacts physical in-stream habitat, water quality, and community structure within aquatic ecosystems. Lowland streams located across the South Central Plains Ecoregion of Arkansas are no exception. Quantifying the relationship between land use and fish assemblage structure patterns can provide important insight for the future of ecosystem management within the region. Eighteen sites were sampled during summer of 2021 for fish, physicochemical, and physical in-stream habitat data. A total of 3,329 individuals and 40 different fish species were collected during this period of sampling and species richness varied from 11 to 27 species per site. Fish communities varied across sites based on NMDS ordination using fish relative abundance data. Patterns of fish community structure in relation to land use, physicochemical, and physical in-stream habitat data will be discussed.

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(8) Assessment of Lower Mississippi River Fish Assemblages During Pre- and Post-Establishment of Invasive Silver Carp *Hypophthalmichthys molitrix*.

Glen C. Jackson*, Cooper E. Barshinger, Derek K. Owens, and Michael A. Eggleton
University of Arkansas at Pine Bluff, Department of Aquaculture and Fisheries, Pine Bluff, AR
jacksog8275@uapb.edu

During the 1990s, Silver Carp *Hypophthalmichthys molitrix* were rare in the Lower Mississippi River (LMR) and only sporadically collected. However, since 2000, the species has become widely established throughout the LMR, inhabiting most main-stem habitats and all significant tributaries. Unlike the upper Mississippi River, there has been little research on Silver Carp in the LMR, especially concerning their possible effects on native fish assemblages. During 1995-1997, an intensive fish assemblage dataset was compiled from seven secondary channel locations spanning nearly 900 river kilometers from the Kentucky-Missouri border downstream to the Mississippi-Louisiana border. Fish assemblages were assessed in five macrohabitats at each location during both falling-water (July-August) and low-water (September-October) river stages. The primary goal of this 3-year (2021-2023) study is to resample these historical study sites, which all now contain high abundances of Silver Carp, to examine possible structural shifts since the 1990s. Preliminarily, 2021 fish sampling yielded 29,951 individuals representing 34 different species and 17 families. Silver Carp alone comprised 15% of the numerical catch, but were estimated to have contributed as much as 50% of the total fish biomass. Given that many aspects of LMR fisheries are not well understood, this study represents a unique opportunity to assess responses of a large-river fish assemblage collected over broad spatial and temporal scales to a biotic stressor (invasive carps) now pervasive throughout the Mississippi River basin.

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(9) An Evaluation of Drone Imagery and Supervised Classification to Identify and Quantify Vegetation in Arkansas Reservoirs.

Jamie Kindschuh[1]*, Steve Lochmann[1], and Jonathan Spurgeon[2]
[1]University of Arkansas at Pine Bluff, Department of Aquaculture and Fisheries, Pine Bluff, AR 71601
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The use of traditional sampling approaches including quadrat sampling to estimate aquatic vegetation coverage on reservoirs necessitates extensive effort by field personnel. Aerial drone technology and geographic information systems may provide a more efficient way to capture a snapshot image of vegetation coverage among multiple reservoirs. We assessed the efficacy of using drone imagery and supervised maximum likelihood classification to quantify emergent vegetation within Arkansas reservoirs. We used a DJI Phantom 4 Pro and DroneDeploy image processing software to stitch images together and create an orthomosaic map of three reservoirs ranging in size from 99 ha to 117 ha. We created three training datasets consisting of 10, 20, and 30 images to delineate emergent vegetation, floating-leaf vegetation, and open water. We evaluated the accuracy of the supervised classification rule to differentiate vegetation types among the different training sample sizes and reservoirs with different levels of plant diversity and coverage. An efficient and reliable sampling protocol for sampling vegetation may greatly enhance habitat management projects by providing quantitative evidence for directing resources to locations as well as providing inference to underlying mechanisms influencing fish population dynamics.

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(10) Temporal and Spatial Distribution of Brown Trout Redds on the Greers Ferry Tailwater.

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Arkansas has a vast network of water bodies and a small portion contains tailwater trout fisheries. Arkansas trout fishing contributes over one third of total expenditures for all types of fishing according to the U.S. Census Bureau. The vast economic impact of trout fisheries makes it one of the most valuable fisheries per surface area of water in Arkansas. The Brown Trout in Greers Ferry Tailwater (GFTW) are the only self-sustaining population of trout in Arkansas. Microhabitat characteristics of Brown Trout redds in the GFTW are similar to other tailwater and natural systems around the world where Brown Trout spawning occurs. GFTW Brown Trout spawning is believed by many anglers to occur at a principal shoal named Cow Shoals. Anglers believe Cow Shoals should be closed to fishing during the spawning season. To test the validity of a principal spawning shoal, redds were identified within the GFTW between the beginning of October through the beginning of February by assessing each shoal in two-week time periods. The 2020-2021 spawning season saw nearly ten times as many redds as the 2019-2020 spawning season across a comparable time period. 2,417 Brown Trout redds were found at 27 different shoals throughout the 48km of the GFTW. Instead of spawning at a principal shoal, Brown Trout spawned anywhere that microhabitat conditions were within a suitable range.

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(11) More fish swim to more places (and mussels and crayfish and stuff) – what's been happening in the Arkansas Stream Heritage Partnership.

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The Arkansas Stream Heritage Partnership (ASHP) formed in January of 2017 as the Southeastern Aquatic Resource Partnership (SARP) aquatic connectivity team for Arkansas in the Aquatic Connectivity Program. In true Arkansas partnership fashion, this group has worked collectively as a consortium of cooperating individuals to do great things for conservation in Arkansas. The ASHP has fostered the focus on restoring streams through barrier removal among conservation and outdoor recreation communities in Arkansas and currently has 118 members on the Google Groups email list. Annual meetings for the membership have occurred each year in one form or another and recently, due to the pandemic, a virtual membership webinar workshop was conducted. A Google Drive folder was created and shared with the partnership as a central area to store and share information among the members. A project list set of spreadsheets are actively maintained and have recorded that at least eight barrier removal projects have been completed, another 18 projects are currently proposed and planned, and another 25 projects are listed as potential projects. Recently the team has created a goal-oriented approach to activate more member engagement in barrier removal, and four overall goals have been developed with input from the members.

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(12) Initial Fish Response to Bypassing of a Low–Water Crossing Barrier on a Tributary to the Kings River.

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Low-order streams often make up two-thirds of the total stream length in typical river networks and are critical habitats for many fishes. Connectivity of aquatic habitats is essential for the flow of nutrients and movement of organisms that maintain diverse local communities and beneficial ecosystem functions. A low-water crossing (LWC) existed for >25 years on lower Rockhouse Creek a small intermittent tributary of the Kings River. Preliminary data collected during 2017 and 2018 indicated the LWC functioned as a barrier preventing fish passage from the mainstem Kings River into upstream reaches of Rockhouse Creek. Construction of a new channel, using Natural Channel Design principles, occurred from November 2019 – January 2020 to circumvent the LWC and reestablish connectivity with the Kings River. Fish monitoring efforts included 8 sampling events at 8 sites longitudinally distributed in Rockhouse Creek and 7 sampling events at 3 sites in Keels Creek (nearby reference stream). Fish community sampling began August 2019 and continued seasonally until May 2021. Eleven species previously undetected upstream of the Rockhouse Creek LWC were detected in upstream reaches indicating initial success of the project. Continued biomonitoring is recommended to determine long-term success of this connectivity project as well as inform decisions for future projects.

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(13) Distribution and Status of Mussels in the Louisiana Portion of the Bayou Bartholomew Drainage.

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Freshwater mussels are one of the most imperiled faunal groups in North America as well as in Louisiana. In Louisiana, there are 67 species of mussels, and 40 species are historically known to occur in the lower reach of Bayou Bartholomew. The distributions of mussel species in the lower reaches of Bayou Bartholomew in Louisiana have not been assessed since the early 1990s. A new study is needed to understand temporal changes in the mussel species structure of this system, specifically focusing on SGCN mussel species. A total of 34 sites were sampled across the lower Bayou Bartholomew drainage. Mussels were sampled with various methods using group and timed searches at each site. Thirty-six mussel species were observed across all of the sites. The most abundant species were the Threeridge *Amblema plicata* (26 sites), Pimpleback *Cyclonaias pustulosa* (26 sites), Bankclimber *Plectomerus dombeyanus* (25 sites), and Yellow Sandshell *Lampsilis teres* (24 sites). Compared to previous mussel sampling studies in this system, we sampled sites more efficiently and had higher species diversity estimates across all sites ($p=0.03$). Our results will support management decisions to conserve these species and determine if active measures should be made to help preserve these species.

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(14) Rapid Urbanization and Development Poses Threats to Two Rare Fishes in Northwest Arkansas.

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Healing Springs Natural Area, located near the Northwest Arkansas Nation Airport (XNA) and the cities of Cave Springs and Bentonville, lies in the heart of one of the most rapidly urbanizing areas in the country. Healing Springs is also home to the most robust and genetically unique populations of two rare fishes, *Etheostoma craigini and Etheostoma* sp. *cf. microperca.* Other aquatic SGCNs occur on site as well, exemplifying the natural diversity of the site. The Natural Area was acquired by the Arkansas Department of Transportation for conservation and restoration purposes, and is managed by the Arkansas Natural Heritage Commission. However a new housing development threatens the integrity of the Natural Area, with multiple homes in a planned development being built upstream around the spring sources, which are located outside of the Natural Area's current boundary. Without additional conservation actions, severe impacts will occur to these populations. Many of the other populations of these fishes have already been wiped out or severely diminished by the rapid land-use land-cover change from rural pasture to an urbanizing metropolitan area. Best Management Practices and acquisition methods will be discussed about this extremely high priority conservation need.

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(15) Enhancement of Beaver Lake Fish Habitat: It's All About the Partnerships!

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Beaver Lake is a large (11,500 ha.) flood control reservoir that is owned by the U.S. Army Corps of Engineers. Fish populations in Beaver Lake are managed by the Arkansas Game and Fish Commission and popular sportfish include Largemouth Bass, Spotted Bass, Smallmouth Bass, White Crappie, Black Crappie, Striped Bass, and Walleye. As with most large reservoirs in the southeast, Beaver Lake is aging (56 years old) and much of the original habitat has been lost. The AGFC worked with Beaver Watershed Alliance and at least ten different partners to obtain grants from the Reservoir Fish Habitat Partnership, Fish America Foundation and Bass Pro Shops to improve fish habitat in Beaver Lake and a tributary. A total of 173 fish habitat sites have been placed in the reservoir to date, with each site holding up to six large cedar trees. Several sites have been placed close to bank fishing areas to improve fishing access and success of an underserved angler group on Beaver Lake.

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(16) Quantifying Spatial and Temporal Changes in Riverine Habitat Using Hydroacoustics and Simple Predictive Models.

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Riverine systems are dynamic, subject to changes in discharge and elevation depending on seasonal hydrology regimes, precipitation or hydroelectric management via dams. As river discharge and elevation change so does the availability of suitable habitat needed for various life history strategies of a river's fauna. An increase in elevation or discharge might provide necessary habitat during crucial life history stages, while low or base flows might result in a bottleneck of suitable habitat. Using side-scan sonar, a hydroacoustic technology, we mapped substrates in 50 km of the Verdigris River in Oklahoma that are associated with successful recruitment of Paddlefish. Additionally, depth data, acquired during mapping and from side-scan sonar imagery, was used to create a bathymetric model on which delineated substrates were overlaid. Using these combined data, we modeled the relationship between river gage height and suitable spawning substrates. This model when applied to historical flow data during the 2011-2020 spawning season shows how substrate availability changes spatially and temporally. We found that in the Verdigris River 43% of mapped substrates were suitable and over 70% of suitable spawning substrates mapped were available at base flow. This large proportion of suitable spawning substrates available at a wide range of discharges may be partly responsible for a successful restoration stocking effort. These methods can be applied to model similar relationships of riverine fauna to habitats necessary to their life history strategies, revealing potential restoration locations or bottlenecks.

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(17) Land cover and water quality within the Spring River basin

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Land cover and water quality influence aquatic communities and fish occupancy and dynamics within a river basin. Studies across the United States report influences of varying landscape and water quality factors on salmonid population occurrences and dynamics at varying spatiotemporal scales. One strategy listed in the Spring River trout fishery management plan is to utilize land cover and water quality data from the US Geological Survey's (USGS) National Land Cover Database (NLCD) and the Arkansas Department of Energy and Environment's (AEE) Aquaview database to better manage trout populations and habitat and other fisheries and to help identify potential habitat/stabilization project opportunities for the Spring River mainstem and tributaries. The greatest change in land cover within the Spring River basin from 2001-2019 was observed for forested area. Spatial and temporal differences were analyzed for 22 water quality variables at Mammoth Spring, two sub-basin sites, and three mainstem sites. Utilizing new land cover and water quality data when available, incorporating census and aerial imagery data into analyses, and analyzing seasonal differences in water quality, land cover changes near the mainstem, and relationships between land cover and water quality data will assist in better management of Spring River.

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(18) Development of a Cooperative Water Temperature Monitoring Program for Arkansas.

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A diverse array of projects with varying partners and funding sources are being used to develop a stream water temperature monitoring program for Arkansas. Water temperature is widely accepted as a master variable regulating the distribution and abundance of aquatic organisms. Main objectives of the program include documenting thermal regimes in watersheds with imperiled taxa, identifying streams exceeding thermal criteria, and relating temperatures and hydrology to develop the capacity to predict water quality violations associated with varying environmental flow levels. Higher minimum nighttime summer air temperatures are hypothesized to be related to increased maximum daily water temperatures that exceed critical thermal maximums. Future plans include publishing the data on the National Science Foundation funded CUAHSI.org Hydroserver for viewing on HydroCient, and storing data with at the University of Arkansas. Our initial monitoring program exemplifies the utility of maintaining an array of water temperature loggers and the importance of open communication between multiple project partners as a cost-effective means for obtaining valuable stream water temperature data over multiple spatial scales. Please consider contributing to the monitoring efforts.

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(19) The Lake Monticello Renovation Project

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Lake Monticello is a 1,500 acre impoundment located 5 miles northwest of the city of Monticello, AR. Significant damage to the lake's levee was observed during the summer of 2019, and the lake was completely drained so that the levee could be repaired. By the summer of 2020, the lake bottom had dried enough to get heavy equipment on the lake and the AGFC began habitat work. During July, 41 large brush piles, 117 pallet structures, and 32 porcupine fish cribs were constructed at a total of 54 sites. Additionally, 480 single and 120 double pallet structures, 15 Georgia Cubes, and 100 spider buckets were constructed and placed at a total of 13 sites. Also, a total of 1,653 trees were hinge cut along 16 miles of shoreline. Sunfish spawning areas were also created with pea gravel at a total of 3 sites. A total of 1,510 tons of agricultural lime was spread throughout the lakebed. Rotenone was applied to 25 ponds and 14.5 miles of creeks in the Lake Monticello watershed in order to eradicate Yellow Bass and Grass Carp. The spillway gate was closed on 11/09/2021 and the lake started refilling.

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(20) Fourth-Corner Analysis for Stream Fishes

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Community structure in stream ecosystems consists of a complex array of interactions between abiotic and biotic components that extend beyond the stream itself. Trait-based analyses can shed light on these interactions that determine community structure by considering species' functional traits, which species use to interact within their ecosystem. Currently, there is limited information on the multi-scale drivers of fish community structure within low-order streams. Forth-corner analysis creates a correlation matrix that examines the relationship between species traits and habitat characteristics once they have been adjusted from species abundance, and is popular in trait-based botany studies but rarely used for stream fish studies. We collected fish abundance data at 50 sites within the Ouachita National Forest in the summer of 2020. We then used forth-corner analysis to evaluate how overall fish community structure was influenced by habitat characteristics, fish species abundances, and species' traits. Forth-corner analysis found no relationship. While forth-corner analysis is popular for botany species it may need to be optimized for fish species. Fish studies may need to account for seasonal variation in habitat use and the movement patterns of species more than botanical studies to utilize forth-corner analysis.

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(21) Lake DeGray Vegetation Re-Establishment Project – Vegetation Mapping Update

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Lake DeGray has experienced a dramatic shift in aquatic vegetation abundance over the past few decades. In an effort to improve fish habitat, the Arkansas Game and Fish Commission initiated a vegetation re-establishment project on Lake DeGray in 2019 utilizing up to 22 stationary floating vegetation dispersion cages. A concurrent project using commercially-available down and side-imaging sonar systems has been implemented to track the expansion of naturally-rebounding and emerging colonies in areas featuring dispersion cages and areas without. Presentation will include summary results of scanning 223 hectares in 2021 on Lake DeGray, and a discussion on limitations of the techniques used.

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(22) Science Communication: An Alternative Viewpoint

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Science communication has been a hot topic in the American Fisheries Society for several years now. It has become such a major focal point that a new AFS Section was created, workshops are offered at every Society-level meeting as well as many smaller unit meetings, and there is almost always a plenary talk with this theme. Much of this emphasis has been driven by the issue of climate change and so-called "denial" that is often discussed in the traditional media, on social media, and by various political entities, which often convolutes science communication. The Covid-19 pandemic brought science communication into the worldwide media limelight over the past two years, with many scientists in the medical and epidemiological fields delivering press conferences and appearing in the media. Their words were often met with skepticism by politicians and pundits. This presentation will look at some lessons that Fisheries professionals can learn from observing how these scientists have communicated with the public.

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(23) Sharing Your Science

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As scientists and researchers, we are often taught to or take classes on how to be a better scientific writer. Research project objectives commonly include producing a report that is written for publication into a scientific journal. Additionally, it is more common that we are sharing research findings to colleagues or fellow scientists. However, with large masses of populations using social media as their primary source of information, is the writing we produce fit for social media? Trying to summarize research findings into 160 characters is tough, so how do you decide what to include? Like scientific writing, communicating science via social media platforms also takes practices. How can you communicate science that is in peer-reviewed journal on a publicly shared platform?

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(24) Family and Community Fishing Program: A Recruitment, Retention, and Reactivation (R-3) approach to the outdoors in Arkansas during the Pandemic.

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In an effort to increase awareness and participation in angling opportunities in densely populated areas of Arkansas, the Family and Community Fishing Program (FCFP) was formed in 2002. Arkansas Game and Fish Commission (AGFC) provides seasonal stockings of channel catfish, rainbow trout, bream, and largemouth bass for 47 FCFP locations. During the Spring of 2018, Family Fun Day (FFD) events were implemented as a new way of reaching a diverse population of potential outdoor enthusiasts in various cities. FFD events consisted of community partners and various AGFC divisions working together to provide the ultimate outdoor experience that would recruit, retain, and reactivate folks into the outdoors. The main fish species promoted during the events were catchable channel catfish. An array of outdoor activities including archery, air rifles, canoeing, wild game cooking, and tasting stations, focused on how to cook and clean your catch were marketed to cities in both English and Spanish. A chance to win an outdoor-related activity prize package such as guided hunting and fishing trips was offered to families who registered online for a FFD event. Onsite free health and wellness screenings were also offered during FFD events. The use of AGFC's media outlets (website, newsletter, magazine, TV, radio and social media accounts) allowed for more public awareness of FFD events. This presentation will focus on marketing FFD events and seasonal fish stockings as a method to potentially increase fishing license sales and public interest in fishing and in the outdoors during the pandemic.

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(25) Rainbow Trout Delayed Mortality in Bull Shoals and Norfork Tailwaters

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Arkansas Game and Fish Commission (AGFC) stocks trout throughout the state, with nearly 1.5 million being stocked annually. Substantial amounts of agency funds are allocated to stocking and hatchery programs. Bull Shoals and Norfork tailwaters account for over half of all trout stocked in the state. However, extremely low annual survival (0.2%-11.7%) of Rainbow Trout *Oncorhynchus mykiss* in some of Arkansas's tailwaters has been observed by AGFC. Causes of natural mortality are often complex and not easily managed. Therefore, limiting fishing mortality is often utilized to reduce additional mortality. Catch-and-release experiments were used to evaluate hooking mortality of Rainbow Trout. Each season, ~50 fish from each hook type and sample site were included in the delayed mortality experiments. Chi Square Goodness-of-Fit tests were used to examine the effects of hook type, hook location, season, and TL on mortality. The overall hooking mortality rate for Rainbow Trout was 8.8% for Bull Shoals and 10.0% for Norfork. Artificial and bait mortality were 3.3% and 13.0% for Bull Shoals and 5.1% and 13.2% for Norfork, respectively. Mortality rates of fish caught on bait were 8.8% higher than fish caught on artificial lures. Hooking location had the greatest impact on survival. Deep hooked fish (i.e., gills, raker, gullet) had the highest mortality rates (i.e., 19.4%).

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(26) Novel Approach to Utilizing Remote Cameras in Estimating Fishing Effort: Maximizing Efficiency.

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An understanding of angling effort is essential for informed management of fisheries resources. Effort can be useful as a performance measure for management actions, to estimate the economic impact of a fishery, and inform decision making related to fish and wildlife agency resource allocation. Effort also directly influences other important components of a fishery such as exploitation rate and harvest. Effort is generally estimated within the framework of a creel survey, where instantaneous boat or trailer counts are made to inform effort estimates. Creel surveys are costly and time consuming and as a result creel design is commonly dictated by logistics and funds rather than characteristics of the fishery or study objectives. Remote cameras are a cost-effective tool for improving the efficiency of collecting effort data. Current study designs that incorporate remote cameras generally utilize motion triggered or high frequency time-lapse photos to measure effort directly and the costs associated with photo processing limit the efficacy of their use. When appropriate for addressing study objectives, I propose an alternative design using low frequency time-lapse photos to record instantaneous counts that are then used in traditional creel survey effort estimation. Using several case studies, I assess effort and standard error estimates across a range of instantaneous count frequencies. In all case studies, recording 2-3 counts per day for all weekend days and a truncated number of weekdays produce effort and standard error estimates within 10 percent of the highest frequency count results (13 counts per day). Still, conducting a camera survey with 13 counts per day can be invaluable for informing creel survey design. When instantaneous counts are appropriate, I demonstrate that photo processing effort can be drastically reduced using this methodology.

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(27) Spatial Patterns of Florida Largemouth Bass Genetic Introgression into a Northern Largemouth Bass Population after Stocking.

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To enhance trophy potential of largemouth bass (*Micropterus salmoides*) fisheries, state agencies across the southeastern United States commonly stock Florida largemouth bass (FLMB, *M. s. floridanus*) outside of their native range into native northern largemouth bass (NLMB, *M. s. salmoides*) populations. This practice has been ongoing for decades but spatial patterns associated with the spread of FLMB alleles in a reservoir after stocking are little understood. The Arkansas Game and Fish Commission stocked 250 FLMB fingerlings ha-1 from 2007-2015 into two embayments of Lake Ouachita, a 16,200-ha highland reservoir in western Arkansas. In 2019, we collected 1000 largemouth bass from throughout the reservoir to examine spatial patterns of FLMB introgression using a panel of 35 species-diagnostic single-nucleotide polymorphisms (SNPs). We determined that 30.4% of individuals were NLMB, 69.6% were hybrids of NLMB, and FLMB and no FLMB were collected. Spatial analyses found that FLMB alleles were greater in individuals collected in close proximity to stocking areas and eastward through the main body of the reservoir. Conversely, FLMB alleles were lower in the western half of the reservoir. Our results provide evidence that localized stocking of FLMB at high densities into a resident NLMB population can lead to widespread genetic shifts even in very large systems, but most individuals contain low levels of FLMB alleles (average % FLMB alleles across all individuals collected was 11.4%).

(28) Evaluation of lake-wide population characteristic differences between the Northern Largemouth Bass and its Backcross following Florida Bass stocking in a large reservoir.

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To enhance trophy potential of largemouth bass fisheries, state agencies across the southeastern United States often stock Florida largemouth bass (FLMB, *Micropterus salmoides floridanus*) outside of their native range into populations of native northern largemouth bass (NLMB, *M. s. salmoides*). This practice has been ongoing for decades, in many cases with vague stocking objectives or objectives focused on achieving a certain level of genetic introgression. A typical result of these stockings are a lake-wide shift in the genetic composition of Largemouth Bass towards individuals with less than 50% Florida Bass genetics (FxN), but little work has compared population characteristics between native NLMB and FxN hybrids. The Arkansas Game and Fish Commission stocked FLMB in Lake Ouachita, a 16,200 ha highland reservoir in western Arkansas, over an eight year period. Four years after the final stocking, we collected 1,000 Largemouth Bass spread around the entire perimeter of the lake and utilized a 35 species-diagnostic single-nucleotide polymorphism (SNP) panel to determine % FLMB alleles of each individual fish. We used these genetic results to evaluate differences in age-at-maturity, mortality, and growth rate. Preliminary results indicate that few differences exist between FxN and NLMB fish in these population parameters. These results have implications for FLMB stocking outside of their native range. Based on several population parameters, FxN hybrids did not appear inferior to NLMB, but FxN hybrids did not appear superior to NLMB either, though the original stocking objective of the program (40% of individuals locally with some FLMB alleles) was exceeded. Additional work is needed to provide guidance to agencies in establishing and meeting stocking goals based on phenotypic outcomes.

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(29) A Comparison of Two Low-Frequency Electrofishing Waveforms on Capture Efficiency and Length Distribution of Flathead Catfish in Felsenthal Reservoir, Arkansas.

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Understanding how varying duty cycle affects capture efficiency and length distributions of Flathead Catfish can aid fisheries managers in data collection. A total of 42 low-frequency electrofishing runs were conducted with a Midwest Infinity Electrofisher and a chase boat to collect Flathead Catfish at 21 randomly selected river kilometers within Felsenthal Reservoir. At each randomly selected river kilometer, two 10-minute long electrofishing runs were conducted using a duty cycle of 10% and a duty cycle of 30%, and pulse-width was held constant at 15Hz. A Kolmogorov-Smirnov test revealed that length distributions for Flathead Catfish varied significantly with duty cycle ($D=0.27$, $P<0.001$). Catch per unit effort (CPUE) did not differ significantly among duty cycles for Flathead Catfish overall ($t=1.1$, $df=40$, $P=0.28$). However, CPUE of quality sized ($\geq$ 510 mm) Flathead Catfish was significantly higher with a duty cycle of 10 (CPUE=20.83, SE=3.5) than a duty cycle of 30 (CPUE=8.49, SE=1.9; $t=3.1$, $df=40$, $P=0.004$). These data suggest that a length bias associated with duty cycle for Flathead Catfish may exist. Future research is needed to examine this relationship further. However, biologists may consider using a 15Hz/10% waveform to increase capture efficiency of larger fish.

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(30) Hypoxia Related Mortality of Striped Bass in Norfork Lake.

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Striped Bass are commonly stocked in midwestern reservoirs. The resultant fisheries provide angler and ecological benefits. Norfork Striped Bass stockings began in the 1960's and have historically supported a world-renowned fishery. However, increasing summer fish kills threatens the future of this fishery. These summer kills are likely facilitated by thermal and oxygen refugia reductions. Norfork depth, temperature and oxygen profiles suggests available thermal and oxygen refugia (i.e., hypolimnetic oxygen maxima) is reduced overtime. Interestingly, this reduction occurs faster and at higher intensities during high water periods. Such conditions initiated a fish kill in 2017 and 2019 in Norfork Lake. This provided an opportunity to investigate and describe population dynamics. Dead or dying striped bass were collected by Arkansas Game and Fish Commission and Missouri State University. Fish were measured to nearest total length and otoliths were removed for aging. Age information was used to quantify population dynamics and construct Beverton-Holt yield per recruit models. Additionally, we evaluated oxygen thresholds through controlled tank experiments. Striped Bass were allowed to deplete oxygen across reservoir representative temperatures (i.e., water temp at oxygen refugia). Yield models suggested relatively low exploitations can result in trophy potential reductions. Striped Bass mortality occurred when dissolved oxygen (DO) values ranged between 0.5-1.5 ppm. Depth profiles suggest during high water events, lake DO levels regularly fall within or exceed our observed DO mortality thresholds. Climatic variability and the resulting hydrological alterations may impact reservoir operations. If higher lake levels continue to degrade the thermal and oxygen refugia, Striped Bass may continue to experience summer die-offs.

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(31) Summary of Arkansas Game and Fish Commission Fish Aging Assessment and Discussion of Future Efforts.

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Estimates of growth, total mortality, and recruitment of a fish population are generally derived from an age and growth assessment and are essential to informed fisheries management decision making. These assessments involve standardized collection of aging structures from individuals across a range of lengths. Estimated ages are determined from the structures and extrapolated to the entire fish sample for analysis. Accuracy and precision of estimated age among-readers is assumed to be high. In fall 2021, the Arkansas Game and Fish Commission Fish Aging Committee conducted an aging assessment of Fisheries Management Section staff for a variety of species and aging structure types to direct prioritization of training resources. Staff were asked to age 180 structures as well as answer questions related to experience level and desired training. Precision was highest among crappie, bass and walleye otoliths and lowest among catfish spines and otoliths. This correlated with reported levels of experience with these species/structures. Staff primarily requested additional guidance on reading catfish spines and walleye otoliths as well as age structure preparation and data analysis. This assessment will guide the aging committee's efforts to produce training resources.

Poster Session Abstracts

(P-1) Does Diet of *Luxilus pilsbryi* Vary in Response to Stream Drying?

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Intermittent streams, characterized by cessation of flow over lengthy periods of time, play an essential role in maintaining biotic diversity and integrity of perennial streams. Adaptations of fishes to these conditions include increased diet breadth and, in one study, changes in gut length when food quality and quantity decreased. *Luxilus pilsbryi*, found in both intermittent and main channel perennial streams, feeds primarily on macroinvertebrates and some vegetation. Individuals were collected across all seasons from Rockhouse Creek, an intermittent tributary of the Kings River. We found that gut length (adjusted for standard length) varied significantly across seasons, with the longest gut lengths found in spring (ANCOVA, $p<0.01$). To explore the possible cause, gut contents were examined and identified to the lowest possible taxon, enumerated, and massed. Fish collected in spring consumed more total food (by mass) relative to all other seasons. Winter and spring stomachs contained mostly aquatic invertebrates; summer and fall stomachs largely contained amorphous material—plant/detritus. The shift to a plant/detritus diet did not correspond with increased gut length, suggesting that *L. pilsbryi* cannot compensate during low/poor food periods through morphological adjustments of gut length and may reflect their facultative association with intermittent headwater streams.

(P-2) Weight-Length Relationships of Bluegill *Lepomis macrochirus* and Largemouth Bass *Micropterus salmoides* Across Aquatic Habitats.

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Weight-length relationships (WLR) in fishes are influenced by a suite of abiotic and biotic factors. Influential factors include habitat size and water quality, both of which can also be influenced by the relative connectivity and overall size of the aquatic ecosystem. We investigated the differences in length and weight data in two economically and ecologically important regional species: Bluegill *Lepomis macrochirus* and Largemouth Bass *Micropterus salmoides*. In 2021 and 2022 Arkansas Tech University (ATU) students sampled fish from 2 ponds located on ATU campus, 2 sites on Lake Dardanelle, and 2 stream sites with seines, minnow traps, fyke and hoop nets as well as backpack and boat electroshocking. We examined the difference in the WLR across sites for both species. Using multiple linear regression, we found significantly higher WLR for Bluegill in Lake Dardanelle versus pond or stream sites. For Largemouth Bass, pond fish had a significantly higher WLR, however there was not a difference in WLR between stream and lake populations. These results highlight the need to better understand factors differentially affecting WLR for focal species across aquatic habitats in our region.

(P-3) Urbanization of the Arkansas River Valley leads to decreases in species richness and altered trophic patterns

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Urbanization is the process in which humans have altered the natural landscape in response to a growing population. A few of the ecological consequences of urbanization have been decreased species richness, increased abundance of generalists, and degradation of habitat. The aquatic ecosystems within the Arkansas River Valley have become increasingly urbanized by an impoundment that formed Lake Dardanelle, man-made ponds, and increased discharge to local streams. We examined differences in trophic membership between fish species captured by Arkansas Tech University (ATU) Fisheries Techniques course in Mill Creek, an intact stream, and Panther Bay of Lake Dardanelle, a remote bay, and the following urbanized systems: ATU ponds, a tributary of Prairie Creek, and the discharge bay of Arkansas Nuclear One. We compared the trophic group proportions of fishes captured at each site as well as species richness. In our intact stream, there was a greater frequency of benthic feeders and specialists. In the urbanized systems there was an even distribution of trophic groups. Species richness was higher in Mill Creek when compared to the average species richness of all urbanized systems. These results emphasize that changes in fish assemblages also leads to alteration in trophic membership which ultimately indicates altered aquatic ecosystem food webs.

(P-4) Effects of Water Body Size and Habitat Characteristics on Species Richness and Weight/Length of Fish Sampled From Locations.

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The state of Arkansas is home to many diverse water bodies ranging from mountain streams, ponds, large rivers, bottomland swamps, and reservoirs. Species richness in Arkansas varies greatly between each body of water. Data collected by ATU Fisheries Techniques in 2021 from Lake Dardanelle, Mill Creek, Prairie Creek, and Illinois Bayou was compared to data collected by us in January 2022 at ATU ponds 1 and 2. Species richness and the influence habitat characteristics had on richness and weight/length were examined. Data was collected using hoop, fyke, and seine nets, in addition to backpack shocking. We used an ANOVA to determine whether water body type influenced the weight/length relationship across species. We found significant differences in the weight/length relationships between most species as expected. We also found differences by habitat type with stream fish having a close to significant lower weight/length while fish in Lake Dardanelle exhibited a higher weight/length. Species richness among sites had a high variability due to water body area, sampling error, weather conditions, and habitat characteristics. We found that Mill Creek, one of the smallest areas sampled, had the greatest species richness. This could be attributable to gear type and sampling effectiveness.

(P-5) Comparison of Field Acclimatization and Lab Acclimation Approaches to Measuring Fish Thermal Tolerance.

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Increased temperature may negatively impact fish in freshwater systems, particularly fish in urban streams. Measures of thermal tolerance, such as critical thermal maximum (CTMax), are often used to measure and indicate species' vulnerabilities to increased environmental temperatures. Historically, CTMax was commonly measured for fish acclimated to lab conditions over time. More investigation into protocols used to measure CTMax are needed to determine methods that best reflect fish CTMax measures in the field since laboratory acclimation protocols might introduce confounding factors or other sources of variation. We measured CTMax of 150 Highland Stoneroller (*C. spadiceum*) and 150 Blackspotted Topminnow (*F. olivaceus*) individuals collected from an urban stream, Tucker Creek. Groups of fish were tested for CTMax using a field acclimatized approach on the same day of capture and after being held overnight. Groups of fish were also tested for CTMax following acclimation to ambient and constant temperatures after 10 and 20 days in the laboratory. Individuals of both species tested on Day 0 and Day 1 did not exhibit significant differences in CTMax. After ten days acclimation, both species exhibited differences in CTMax that were dependent on acclimation regime.

(P-6) Fish Response to Rainfall and Temperature Data in the Arkansas River Watershed.

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Increasing our understanding of climatic influences on patterns of fish species richness and abundance is a critical component of aquatic ecosystem conservation and management. To assess the impacts of regional annual climate patterns on species richness and abundance in local water bodies we analyzed fish and water quality data collected from surveys conducted by Arkansas Tech University (ATU) Fisheries students from 2021-2022. Surveys took place on Lake Dardanelle, ATU campus ponds, and surrounding watersheds utilizing hoop, seine, trap and trammel nets, as well as boat and backpack electro shockers. We obtained rainfall and temperature datasets from the Russellville National Airport and climate reports from the National Weather Service from 2020 - 2022. Trends in temperature and rainfall showed an average increase in temperature and decrease in rainfall. In general, the data we collected showed a positive correlation between fish abundance and temperature and a negative correlation between abundance and rainfall. Total species richness stayed consistent throughout the years except for the absence of gizzard shad in 2022 in ATU ponds. This work emphasizes the importance of understanding relationships between aquatic ecosystems and climatic patterns to better preserve the state's aquatic biodiversity.

(P-7) Environmental Gradients Influence Cohabitation and Body Condition of *Lepomis marginatus* and *Lepomis megalotis.*

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Dollar Sunfish (*Lepomis marginatus*) is an uncommon sunfish in Arkansas that prefers lowland streams, low flow, and muddy substrate. Longear Sunfish (*Lepomis megalotis*) is closely related, abundant across Arkansas, and prefers upland streams with permanent/semi-permanent flow and rocky substrate. Streams sampled in the Arkansas South Central Plains (SCP) in summer 2021 revealed *L. marginatus* and *L. megalotis* often did not inhabit the same streams although they are both distributed across the SCP ecoregion. Between both species we collected only *L. marginatus* at 10 sites, only *L. megalotis* at 4 sites, and both at 3 sites. Using classification trees, dissolved oxygen (DO) was highest (>3.95 mg/L) at sites with only *L. megalotis* and lowest (<3.95 mg/L) for sites with only *L. marginatus*. Sites that contained both species were also characterized by low DO and higher gravel substrate (>44%). Body condition of *L. megalotis* was significantly lower when sympatric with *L. marginatus* compared to sites containing *L. megalotis* only, suggesting biotic (competition with *L. marginatus*) or abiotic (dissolved oxygen) factors may be playing a role. Results indicate *L. megalotis* and *L. marginatus* may coexist in low dissolved oxygen streams with high gravel percentage, but *L. megalotis* suffers in body condition.

(P-8) Seasonal flow variability influences density-dependent interactions of a headwater stream fish.

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The strength of intraspecific interactions among stream fish often rely on the extent to which a common resource is shared. Outcomes of such interactions are influenced by abiotic factors in the surrounding environment and can vary in time and space. One such abiotic factor: flow variability, is unique to stream and riverine environments and can influence the abundance of prey and available habitat. Our study used artificial stream systems to investigate the seasonal effects of flow variability and fish density on the strength of intraspecific competition of mottled sculpin (*Cottus bairdii*). Sculpin were assigned to one of three density treatments: (1) two individuals, (2) four individuals, or (3) eight individuals. Density treatments were then crossed with either low variability in flow or high variability in flow. Our experiment was replicated during the spring season and the fall season with new individuals. Our results demonstrate an inverse significant effect of season and a negative effect of flow variability on change in sculpin body condition. Additionally, there were marginally significant declines in body condition with increasing density. Our findings suggest that density-dependence in sculpin could be a potential driver of seasonal changes in abundance and distribution of sculpin in headwater streams.

(P-9) Variation in Fish Communities of Boston Mountain Streams in the Ozark National Forest.

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The Boston Mountains of the Ozark-St. Francis National Forest have a rich history of conservation spanning hundreds of years. This Pennsylvanian Period mountain range yields high amounts of sandstone and shale, resulting in aquatic ecosystems unique to the state of Arkansas. Thirty-five sites across Big and Little Piney creeks, Illinois Bayou, Mulberry River and Lee Creek watersheds were analyzed using nonmetric multidimensional scaling to examine fish community level differences among sites using relative abundance data. Fish community composition was significantly different across watersheds (multi-response permutation procedure, $p<0.05$). An indicator species analysis identified ten species of fish as significant ($p<0.05$) indicators of specific watersheds including *Etheostoma pulchellum 1* in the Big and Little Piney creeks, *Micropterus dolomieu* in the Illinois Bayou, *Pimephales notatus* in the Mulberry River, and *Fundulus catenatus* in Lee Creek. Stream catchment size was one of the strongest drivers in determining relative abundance of each species per site. Additional variation is likely related to abiotic factors such as differing substrate and water physicochemical properties. This study will provide useful insight into the community structure and habitat associations of fishes in streams of the Boston Mountains.

(P-10) Fish Radiological Sampling in Lake Dardanelle, Arkansas

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The Arkansas Department of Health (ADH) Nuclear Planning and Response Program requires monitoring of radionuclides in sport and non-game fish in the Arkansas River. As part of the ADH program, Arkansas Tech University collected fish and sediment samples in the discharge bay of Arkansas Nuclear One (ANO) and in Panther Bay (upstream of ANO) on Lake Dardanelle in 2020 and 2021. Half a gallon of sportfish and nongame fish fillets were collected via boat electrofishing. Species richness in Panther Bay (10) was double of that in the ANO discharge bay (5) in 2021 and equal in 2020 (8). More Largemouth Bass *Micropterus salmoides* were caught at both sites in 2020 (18 at each) than in 2021 (9 across both sites). Lengths and weights of Largemouth Bass and Gizzard Shad *Dorosoma cepedianum* were both greater in 2021 than 2020 but did not significantly differ between sites. Higher species richness in Panther Bay and the presence of rarer species such as Spotted Gar *Lepisosteus oculatus* may indicate better habitat quality in this reach. Continued monitoring will enhance our understanding of the influence of both annual climactic variability and habitat quality on species richness in Lake Dardanelle.

(P-11) Summary of 2021 Small Impoundment Extension Cases.

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The University of Arkansas Division of Agriculture Cooperative Extension Service operates under a model where County Extension staff provide research-based guidance to residents within four primary categories including youth development, family and consumer science, community and economic development, and agriculture and natural resource education. The state funds extension research centers at experimental stations and universities staffed by extension specialists to research and develop practical solutions to the most pressing issues in the four categories of work. While county extension staff are able to handle most small impoundment-related issues, thanks to in-service trainings, fact sheets, and other publications, some issues must be referred to specialists for additional support, advanced diagnostics, or for sampling beyond the reasonable expectations of county staff. In 2021, 75 consultations, 52 water analysis reports, 34 site visits and 7 comprehensive small impoundment evaluations were completed. Twenty-percent of the cases were regarding vegetation management, with fish assessment, general pond assessment, building new ponds, and fish stocking completing the top five most-frequent of 17 total general issues. Vegetation identification, prevention, and treatment continues to be, by far, the most important issue regarding small impoundments in Arkansas and those working in these systems must prepare for this above all else.

(P-12) Proposed Standard Weight (Ws) Equation and Length-Categorization Standards for Brown Trout *Salmo trutta* in Tailwater Systems.

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Standard weight equations are widely used by managers to calculate relative weight values. These values give insight into population dynamics and can help inform management decisions. Their use is commonly reliant on the development of length-categorization standards. These categories can be used to assess the size structure of a population. There are no standard weight and length-categorization standards for Brown Trout *Salmo trutta* that exist in highly-modified, tailwater environments. Because tailwaters are economically and recreationally important, it is critical for managers to have access to tools that will allow them to better manage these systems. We sought to create a standard weight equation using the regression line percentile technique. The equation is as follows: $\log_{10}Ws(g) = -5.1687 + 3.0812 \log_{10} TL\ (mm)$. This equation should only be used for tailwater Brown Trout between 140-930 mm TL. The proposed length categories are based on the current International Game Fish Association's all-tackle world record length Brown Trout and the suggested length categories in Gablehouse 1984. The proposed length categories are as follows: stock, 200 mm (8 in); quality, 400 mm (16 in); preferred, 500 mm (20 in); memorable, 600 mm (24 in); trophy 750 mm (30 in).

(P-13) Development of a Predictive Stream-barrier Model in the Ouachita Mountain Ecoregion in West-central Arkansas.

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The Ouachita Mountain ecoregion is impacted by thousands of road-stream intersections. Road-stream crossings may fragment streams and impact fish movement. The goal of this project was to develop a tool that can predict stream crossing barrier severity scores based on explanatory variables extracted from existing GIS layers and databases. To accomplish this goal, the project has two objectives, including: 1) to conduct a stream crossing inventory using the Southeastern Aquatic Resources Partnership (SARP) protocol to build a database of stream crossings for the Ouachita highland ecoregion which will be used to calculate the NAACC barrier severity scores, and 2) to assess which explanatory variables determine the likelihood that the stream crossing creates barriers to fish movement (i.e., high barrier severity scores). We measured 300 road-crossings following the SARP protocol and derived barrier severity scores for those crossings. We used Boosted Regression Tree models to assess the relationship between landscape and hydrological variables (i.e., predictor variables) and a subset of the derived barrier severity scores (i.e., response variable). We used the withheld derived barrier severity scores to complete repeated rounds of k-fold cross-validation and then average the results to assess the accuracy of the predictive model.

Notes: