

AGFC – INCENTIVIZED HARVEST PROGRAM IN LMR & ARW SUB-BASINS**Project Title:**

Arkansas Invasive Carp Market Stimulation Project in the Arkansas-Red-White River and Lower Mississippi River Sub-basins.

Lead Author, Agency, and Contact Information:

Matthew Horton, Arkansas Game and Fish Commission, Matthew.Horton@agfc.ar.gov

Participating Agencies:

Arkansas Economic Development Commission (AEDC), Richard Eberle, richard.eberle@akansasedc.com

Location of Activities:*Arkansas-Red-White River Sub-basin (ARW)*

Locations where commercial fishers can harvest invasive carp and receive subsidies through this program include all waterbodies of Arkansas, within the Arkansas-Red-White River Sub-basin, which are open to commercial fishing. These waters include the Arkansas River (Pools 4, 5, 6, 7, 8, 9, 10, 11, 12, and 13 to the Oklahoma state line), White River (from the confluence of the Little Red River to the confluence of the Black River), Black River, Red River, Sulfur River, and Little River; their tributaries, backwaters, and oxbow lakes.

Lower Mississippi River Sub-basin (LMR)

Locations where fishers can harvest invasive carp and receive subsidies through this program include all waterbodies of Arkansas, within the Lower Mississippi River Sub-basin, which are open to commercial fishing, and portions of the Mississippi River sharing a border with Tennessee and Mississippi. These waters include the Mississippi River (RM 828 at the Arkansas-Missouri border to RM 507 at the Arkansas-Louisiana border), Arkansas River (from its confluence to Emmett Sanders Lock and Dam, near Pine Bluff), White River (from its confluence to the mouth of the Little Red River), Ouachita River (from the Louisiana state line to the US Hwy 79 Bridge in Camden), Saline River (from its confluence to the US Hwy 278 Bridge), Bayou Bartholomew, Bayou Meto, Cache River, L'Anguille River, St. Francis River (from its confluence to the Left Hand Chute of Little River); their tributaries, backwaters, and oxbow lakes.

Statement of Need:*Arkansas-Red-White River & Lower Mississippi River Sub-basins*

Populations of invasive carp (Silver, Bighead, Black, and Grass Carp) have rapidly expanded throughout the Mississippi River Basin, and continue to increase their distribution in Arkansas waters. Control of invasive carps is necessary to reduce their impact on native species, the ecosystem, and the economy. The AGFC recognized commercial harvest was the most efficient

and effective method to remove invasive carp, and attempted to implement a contract fishing program in 2020, utilizing federal invasive carp grant funds. The goal was to hire up to four commercial fishers to remove 800,000 pounds of invasive carp from the Arkansas and White River systems, within the Lower Mississippi River (LMR) and Arkansas-Red-White River (ARW) Sub-basins. At the time, Arkansas did not have a fish processor or other buyers that would accept invasive carp. Contractors would be paid 20-30 cents per pound, which increased as poundage goals were met to remove invasive carp. Free gear tags were offered to incentivize removal. Contract stipulations were restrictive, and included only allowing harvest of invasive carp; other commercial gear could not be fished within 15 miles of the access point, and all commercial tackle had to be provided by the commercial fishers. In October 2020, letters were sent to all current commercial fishing permit holders (approximately 1,350), advising them of the contract availability. Nineteen commercial fishers communicated interest and were sent an RFQ. No commercial fisherman submitted proposals by the deadline date.

Subsequently, the AGFC implemented an in-house removal program (AGFC Invasive Carp Removal Program), which initiated in October 2021. The program has removed several hundred thousand pounds of invasive carp and contributed valuable information such as range distribution, density, and size structure of invasive carp in the Arkansas and White River systems. However, there is still a need to improve effectiveness of removal efforts and significantly increase the biomass removal of invasive carp from Arkansas waters.

Despite the abundance of commercial fishers, Arkansas lacks processing facilities, established markets and large-scale applications for invasive carp, which limits commercial value, market opportunities, and incentives for harvest. To address these limitations, AGFC is developing an incentive program, which provides subsidies to commercial fishers for harvesting and selling invasive carp and encourages collaboration between fishers and wholesale fish dealers, processors, or other buyers to stimulate market demands for invasive carp caught in Arkansas. In addition, AGFC partnered with the Arkansas Economic Development Commission (AEDC) to help interested businesses expand processing capacity and market development into Arkansas.

AGFC is working to phase out the in-house removal program (agency removals) and shift removal efforts to commercial harvest by 2026. AGFC will outline conversion of agency removal efforts to re-direct existing staff, equipment, and future federal funding requests to support monitoring of invasive carp populations and commercial harvest, which directly informs commercial fishing effectiveness and optimization of control strategies.

Project Objectives:

Arkansas-Red-White River & Lower Mississippi River Sub-basins

1. Stimulate the commercial market for invasive carp in Arkansas through incentivizing subsidies to help control invasive carp populations.
 - 1.1. Implement a subsidy for invasive carp sales to attract commercial operators such as processors and wholesale fish distributors to Arkansas.
 - 1.2. Incentive commercial fishers to target and harvest invasive carp.
2. Provide start-up supplies and access to equipment for licensed commercial fishers, wholesale

fish distributors, or processors.

- 2.1. Provide start-up fishing supplies such as gill nets and rope to licensed commercial fishers.
- 2.2. Provide licensed commercial fishers, access and use of equipment such as ice machines to help ensure wholesale fish distributors, processors, or other buyers receive quality fish for market product uses.
- 2.3. Offer businesses financial assistance opportunities (subgrants) to improve invasive carp markets in Arkansas through the establishment and operation of remote buying locations.
3. Create and administer a subsidy program within the AGFC Fisheries Division.
 - 3.1. Provide salary for one part-time staff to track invasive carp sales and other reporting mechanisms and submit forms for payments to commercial fishers. This staff addition will also work to administer requests for equipment start-ups.
4. Scope standards for monitoring invasive carp populations in Arkansas to evaluate the effectiveness of commercial fishing
 - 4.1. Outline conversion of the Arkansas invasive carp control program to include monitoring which would:
 - 4.1.1. Develop an invasive carp population standard monitoring protocol.
 - 4.1.2. Revise invasive carp control program staff roles, as appropriate, to collect data which directly informs commercial fishing effectiveness and optimal control strategies.
 - 4.1.3. By 2026, phase out AGFC Fisheries Division invasive carp control program (agency removals) once invasive carp commercial fishing is established and invasive carp population monitoring protocol can be implemented by existing Fisheries Division programs.

Project Highlights:

Arkansas-Red-White River & Lower Mississippi River Sub-basins

- AGFC initiated a state-wide Invasive Carp Harvest Incentive Program (ICHIP) in January, which offers resident commercial fishers an \$0.18/lb. harvest subsidy and access to start-up fishing supplies (gill net webbing and rope).
- Four meetings were conducted across the state to provide information about ICHIP, and solicit participation from commercial fishers.
- A landing page developed for ICHIP on AGFC's website <http://www.agfc.com/carpharvest> which provides program information, enrollment forms, program contact information, and real time tracking of carp poundage available for harvest subsidies.
- Forty-five commercial fishers enrolled in ICHIP.
- Gill net webbing and rope were purchased and distributed to all new ICHIP participants.
- Additional supplies, including nine insulated bins, 69 hand totes, and five scales were purchased and distributed to two local markets to help increase market capacity.
- Commercial fishers participating in ICHIP removed 138,008 pounds of invasive carp from ARW Sub-basin waters and 223,562 pounds from the LMR Sub-basin during January to December 2024.

- Local markets and proximity to processors continue to limit commercial harvest.
- A pilot grant program was developed and advertised in December to help improve invasive carp markets. The competitive grant offered an opportunity for one or more businesses to receive financial assistance for operating remote buying stations in Arkansas.
- Hiring process was initiated to onboard a new Invasive Carp Biologist who will lead development and implementation of state-wide invasive carp monitoring efforts.

Methods:

Arkansas-Red-White River & Lower Mississippi River Sub-basins

In January, AGFC implemented an Invasive Carp Harvest Incentive Program (ICHIP), which offered commercial fishers a per pound subsidy for the harvest and sale of invasive carp, start-up fishing supplies (gill net webbing and rope), and limited access to supplies for fish markets to improve market capacity. This marks the first time state or federal incentives were made available to help increase commercial harvest of invasive carp from waters residing within the state of Arkansas. The program was implemented similarly across portions of the ARW and LMR Sub-basins in Arkansas, and is therefore documented as such in this section.

Incentives offered to participants included an \$0.18 per pound subsidy for invasive carp (Bighead, Silver, Black, and Grass Carp) harvested and sold to any buyer, residing within or outside of Arkansas, for any price. Upon enrollment, participants were offered start-up fishing supplies (gill net webbing and rope) to help them build fishing gear to target invasive carp. Gill net webbing and rope specifications were determined from input provided by local commercial fishers, net designs used by AGFC's Invasive Carp Removal Program, and gill netting supplies purchased by TWRA for commercial fishers participating in their Tennessee Carp Harvest Incentive Program.

Locations within the Arkansas portion of the ARW Sub-basin where fishers could harvest invasive carp and receive subsidies through ICHIP included all waterbodies open to commercial fishing. These waters include the Arkansas River (Pools 4, 5, 6, 7, 8, 9, 10, 11, 12, & 13 to the Oklahoma state line), White River (from the confluence of the Little Red River to the confluence of the Black River), Black River, Red River, Sulfur River, and Little River; their tributaries, backwaters, and oxbow lakes.

Locations within the Arkansas portion of the ARW Sub-basin where fishers could harvest invasive carp and receive subsidies through ICHIP included all waterbodies open to commercial fishing. These include the Mississippi River (RM 828 at the Arkansas-Missouri border to RM 507 at the Arkansas-Louisiana border, and includes waters within the main levees sharing a border with Tennessee and Mississippi), Arkansas River (from its confluence to Emmett Sanders Lock and Dam, near Pine Bluff), White River (from its confluence to the mouth of the Little Red River), Ouachita River (from the Louisiana state line to the US Hwy 79 Bridge in Camden), Saline River (from its confluence to the US Hwy 278 Bridge), Bayou Bartholomew, Bayou Meto, Cache River, L'Angeuille River, St. Francis River (from its confluence to the Left Hand

Chute of Little River); their tributaries, backwaters, and oxbow lakes.

Participation in the program was limited to individuals holding a valid Resident Commercial Fish Permit and Resident Fisheries Conservation License. To enroll, participants were required to sign an affidavit agreeing to comply with the terms of the program, provide proof of the required fishing permit and license, and enroll as a vendor with the State of Arkansas. Program terms required participants to possess and maintain a valid Arkansas Resident Commercial Fish Permit, Resident Fisheries Conservation License, and comply with AGFC's monthly commercial fish harvest reporting requirements. Invasive carp harvested had to be sold for a beneficial use, but could be sold to buyers residing either within or outside of the state. No minimum price was required for the sale to qualify for the program's per pound subsidy. Subsidy payments for invasive carp sold by fishers were contingent on the submission of a bill of sale (sales receipt). The bill of sale had to include the fisher's name, AGFC customer identification (CID) number, location of harvest (waterbody name), purchase date, buyer's name and address, receipt number, species, total weight by species, per pound price paid, total price paid, and fisher and buyer's signature. All invasive carp were required to be weighed for sale whole (not headed, gutted, or processed in any way) on a state certified scale.

In January, AGFC mailed a letter to all people who obtained an Arkansas Resident Commercial Fishing Permit in 2022 and 2023, which provided information about ICHIP and encouraged participation future meetings to learn more about the program and enroll. AGFC hosted four meetings in January, which were strategically located across the state to accommodate the distribution of commercial fishers. Meetings were held at the AGFC Little Rock Headquarters on the 17th, Dumas Community Center on the 18th, Southern Arkansas University in Magnolia on the 25th, and Forrest City Civic Center on the 26th.

A part-time Administrative Assistant was hired by the AGFC Fisheries Division to help administer the program, which included development of enrollment forms, processing enrollment forms, verifying and processing bills of sale submitted by fishers for subsidy payment, acquiring and coordinating distribution of start-up fishing supplies to participants, communicating program updates and fielding questions from participants, and maintaining records of program activities.

Through the advertisement of ICHIP, networking by local fishers, and inquiries made by the ANS Coordinator to local and out-of-state fish markets and processors, several businesses expressing an interest in purchasing invasive carp from Arkansas commercial fishers. However, all stated the cost to pick up and transport fish back to processing locations limited their ability to expand their markets into or within the state. To improve invasive carp markets, AGFC amended the grant to reallocate funding to pilot a grant program that supports the operation of remote buying/pick up locations across Arkansas. This was reflected in the addition of Objective 2.3 - *Offer businesses financial assistance opportunities (subgrants) to improve invasive carp markets in Arkansas through the establishment and operation of remote buying locations.*

AGFC continued work toward identifying needs for implementing an invasive carp population assessment protocol for Arkansas, which directly informs the impact of commercial harvest to optimize control strategies. This included the delineation and prioritization of management units, identification of sampling gears and strategies, data sources (fisheries dependent and fisheries

independent data), population metrics, agency personnel, and implementation costs. Identification of sampling approaches and metrics used to evaluate temporal and spatial trends of Silver Carp abundance in LMR and ARW Sub-basin waters of Arkansas will be adopted from recommendations developed through MICRA's ICAC Sampling Approaches Workgroup and Data Analysis Workgroup (SAW & DAW).

Results and Discussion:

Arkansas-Red-White River & Lower Mississippi River Sub-basins

A total of 51 people attended and 24 enrolled in ICHIP during the four in-person meetings held in January. AGFC staff gave a presentation outlining the purpose, objectives, and requirements of the program. Attendees had the opportunity to ask questions, meet program staff, and enroll in the program. One commercial fisher operating a fish market in Arkansas attended the meetings and spoke about their business and intentions for purchasing carp. General feedback from attendees was positive and most expressed interest in participating. A consensus of meeting attendees was the lack of, and proximity to, processors and local markets is the greatest factor limiting commercial harvest of invasive carp in Arkansas.

In February, a landing page developed for ICHIP on AGFC's website <http://www.agfc.com/carpharvest> which provided program information (including the PPT presentation given at the January in-person meetings), enrollment forms, program contact information, and real time tracking of carp poundage available for harvest subsidies. Postcards with a QR code linked to the ICHIP webpage were developed and mailed to all Resident Commercial Fish Permit holders.

Fishing supplies were ordered for ICHIP participants, including 120 spools (3,000 ft. each) of quarter-inch hollow braided polyethylene rope and 120 (25 lb. bails) of 12 ft. deep, 4 and 4 1/4-inch square bar mesh, 8 ply multi-strand monofilament gill net webbing. Each participant who enrolled in ICHIP was offered one spool of rope and 50 pounds of gill net webbing to help them build gill nets to target invasive carp. It took several months to receive the supplies. In July, ANS Program staff coordinated the distribution of supplies to participants who had previously enrolled in the program. The remaining supplies were distributed to new participants upon enrollment.

Upon further investigation, it was determined that purchasing and operating an ice machine for use by ICHIP fishers was not feasible due to cost and lack of suitable location to safely store and provide access to fishers. However, two local fish markets who were purchasing carp provided written requests for supplies to help increase their capacity to purchase invasive carp. AGFC purchased and provided six Pro23-Db1545 insulated containers, and one 500-pound stainless steel platform scale to the Forrest City Fish Market, and three Saeplast D345 Insulated Containers D345, 69 hand totes, and four 500-pound stainless steel platform scales to Freshwater Fish Products. Both markets were able to increase commercial harvest and sale of invasive carp as a result.

From January to December 2024, 45 commercial fishers enrolled in ICHIP. Eleven fishers submitted bills of sale to receive subsidy payment for a total of 361,570 pounds of invasive carp.

Of that total, 138,008 pounds (38%) were harvested from ARW Sub-basin waters, and 223,562 pounds (62%) from LMR Sub-basin waters in Arkansas. While the program was successful in increasing commercial harvest, it still remained limited in both sub-basins due to the lack of markets and proximity to processors.

In December, AGFC advertised a new grant opportunity designed to increase commercial harvest and improve markets for invasive carp in Arkansas, by supporting the operation of remote buying locations. The grant offers up to \$150,000 for one or more business to establish and operate remote buying locations in Arkansas within close proximity to commercially fished waters in the Mississippi, White, Cache, St Francis, Red, Saline, or Ouachita rivers. Recipients would be reimbursed on a per pound basis for invasive carp purchased through remote buying locations. The grant announcement was publicly advertised on AGFC's website, distributed to the Arkansas Commercial Fishing Association, and emailed to over a dozen processors and businesses who previously expressed interest in purchasing carp in Arkansas. The time frame to submit applications was opened for one month (December 6, 2024 - January 5, 2025). AGFC will review and score applications in January 2025. Selected recipient(s) will receive the award via sub-grant agreement with AGFC for a term of one year.

The ANS Coordinator continued to work with MICRA's ICAC Sampling Approaches Workgroup and Data Analysis Workgroup (SAW & DAW) to identify priority management units, develop sampling approaches, and identify metrics for tracking spatial and temporal trends in Silver Carp abundance across river systems in the LMR and ARW Sub-basin. Once the ICAC workgroup's standard sampling protocol for monitoring Silver Carp is complete, it will be adopted by AGFC and implemented across priority management units in both the LMR and ARW Sub-basins. Agency staff, equipment, and supply needs for monitoring Silver Carp populations across Arkansas were identified and budgeted for. One full-time Invasive Carp Biologist will be needed to coordinate and conduct state-wide monitoring activities. Funds to support this staff were proposed and approved through ARW and LMR Sub-basin Partnerships and awarded during the FY24 funding cycle. Also, two part-time technicians will be retained from AGFC's Invasive Carp Removal Program to assist with monitoring activities. AGFC has tentatively planned to transition efforts from agency removals to monitoring by October 2025.

Tables and Figures:

N/A

Recommendations:

- Continue to promote and fund the Arkansas Invasive Carp Harvest Incentive Program to increase biomass removal through commercial harvest.
- Continue to develop and support funding opportunities which help facilitate the operation of remote buying stations in Arkansas to increase market use and fishers' access to buyers.
- Continue to evaluate and adapt harvest incentive needs, both for fishers and buyers.
- Continue to identify and address regulatory or supply chain limitations to improve commercial harvest of invasive carp in Arkansas.

- Identify priority management units within the LMR and ARW Sub-basins in Arkansas, and continue to coordinate with the LMR and ARW Sub-basin Partnership and ICAC workgroups to develop and implement monitoring strategies to track the spatial and temporal changes in abundance and distribution of invasive carp.

AGFC - AGENCY CONTROL PROJECTS IN THE LMR & ARW SUB-BASINS

Project Title: Control of Invasive Carp in the Arkansas-Red-White River and Lower Mississippi River Basin.

Lead Author, Agency, and Contact Information:

Jimmy Barnett, Arkansas Game and Fish Commission, Jimmy.Barnett@agfc.ar.gov

Participating Agencies:

N/A

Location of Activities:

Arkansas-Red-White River Sub-basin (ARW)

White River upstream from RM 176 to dam 1 (35.181408 -91.426635 to 35.756854 -91.637350) including tributaries, oxbows and backwaters; Arkansas River upstream from RM 63 to the Oklahoma state line (34.248872 -91.904208 to 35.395151 -94.431427) including tributaries, oxbows and backwaters.

Lower Mississippi River Sub-basin (LMR)

White River downstream from RM 176 to the Mississippi River including tributaries, oxbows and backwaters; Arkansas River downstream from RM 63 to the Mississippi River including tributaries, oxbows and backwaters.

Statement of Need:

Invasive carp populations have been increasing in most of Arkansas's rivers. Bighead Carp are present in the Arkansas River from the Oklahoma state line to the Mississippi River and in the White River from Batesville (Dam 1) to the Mississippi River. Silver Carp have not been documented above Dardanelle Lock and Dam on the Arkansas River or above Dam 2 on the White River. Grass Carp are abundant throughout the Arkansas and White Rivers. Black Carp have been documented in the White River up to the Devall's Bluff area and the Arkansas River up to Pool 9. These range expansions suggest population numbers for these species are increasing and will likely continue to increase into the future. Public sightings and subsequent reports are increasing in the Arkansas and White Rivers and their oxbows and tributaries. Increasing invasive carp abundance could impact recreational and commercial activities and is likely impacting the ecological stability of these fisheries. While complete elimination of invasive carp is not feasible, management and control of these species is necessary to reduce their impact.

The AGFC continues to implement an in-house Invasive Carp Removal Program to reduce invasive carp populations in the Arkansas and White River systems, within the Arkansas-Red-White and Lower Mississippi River Sub-basins. Removal efforts will help minimize ecological and economic impacts and the likelihood for upstream range expansion. Data collected from fish removed will increase our knowledge of invasive carp distribution, abundance, and size structure and further inform future control efforts.

Project Objective:*Arkansas-Red-White River (ARW) & Lower Mississippi River (LMR) Sub-basins*

1. Reduce invasive carp population numbers by utilizing dedicated agency personnel to implement invasive carp removal in the Arkansas and White River systems.

Project Highlights:*Arkansas-Red-White River Sub-basin (ARW)*

- The removal program netted a total of 36 days.
- A total of 3,493 invasive carp weighing 55,760 pounds were removed from the basin.
- The removal program fished 41.3 miles of gill net during the year.
- Using an active set method of gill netting kept by-catch low and resulted in 0.29% observed mortality of native species.

Lower Mississippi River Sub-basin (LMR)

- The removal program netted a total of 123 days in the Arkansas portion of the LMR.
- A total of 10,170 invasive carp weighing 156,631 pounds were removed from the basin.
- The removal program fished 154.9 miles of gill net during the year.
- Using an active set method of gill netting kept by-catch low and resulted in 0.37% observed mortality of native species.

Methods:*Arkansas-Red-White River (ARW) & Lower Mississippi River (LMR) Sub-basins*

The Arkansas Game and Fish Commission's (AGFC) in-house Invasive Carp Removal Program continued efforts to control invasive carp in portions of the Arkansas and White River systems. Program funding was provided through both the ARW and LMR Sub-basins, allowing for removal activities to occur across the full range of Silver Carp within the Arkansas and White River systems. Federal invasive carp grant funds were used to purchase supplies and repair equipment used for invasive carp removals, staff one full-time Invasive Carp Biologist who supervised the program, and staff up to five part-time Fisheries Conservation Technicians who conducted removal activities. Program operations and removal methods were conducted similarly across both the ARW and LMR Sub-basins in 2024, and are therefore documented as such in this section.

Silver Carp, being the most abundant, were the primary species targeted during removal efforts; however, all invasive carp species were removed if captured. Invasive carp removals in the ARW Sub-basin occurred from the Arkansas River (Pools 5, 6, 7, 8, and 9) and White River, from Batesville (Dam 1) downstream to the confluence of the Little Red River, and includes backwaters, oxbows, and tributaries of these rivers (Figure 1). In the LMR Sub-basin, removals occurred from the Arkansas River (river mile 63 downstream to the confluence with the Mississippi River) and White River (river mile 176 downstream to the confluence with the Mississippi River), and includes backwaters, oxbows and tributaries of these rivers (Figure 2).

The program utilized boat crews consisting of two to three staff in each boat. Boats used for removals were War Eagle 2070 with modified V hulls, outfitted with 115 HP tiller steer outboard motors, and Lowrance Elite 9 side scan sonar units. Gear used to catch and remove carp primarily consisted of gill nets. Prior removal efforts conducted by the program during 2021-2023 demonstrated that gill nets mesh sizes with 4.25 or 4.50-inch square bar mesh resulted in the lowest by-catch of native fishes, and produced higher catch rates and recruited the greatest size distribution of Silver and Bighead Carp within the Arkansas and White River systems. Nets that were 12 feet deep hobbled to 10 feet were most effective in shallow backwater habitats where carp were targeted most often. Also, 7 or 8 ply multi-strand monofilament held together longer than weaker mesh designs. Gill nets used in 2024 were constructed from 7 or 8 ply multi-strand monofilament, with 4.25 or 4.5-inch square bar mesh, 12 feet deep hobbled to 10 feet, with foam core float lines and lead core lead lines. Invasive carp were target using active gill netting methods, which consisted of deploying gill nets to encircle a school, followed by boat motor revving and banging on the boat hull or gunnels to herd and startle the fish into the net. To accommodate this methodology, gill nets were built in 200-yard sections and tied together to form 400 or 600-yard sets.

Removal efforts occurred all 12 months during 2024. Removal locations were determined from catch data recorded during prior removal efforts, AGFC's Aquatic Nuisance Species Reporting Database, information obtained from commercial fishers and other agency staff, and river gauge readings. Areas with highest carp densities were prioritized for removal. Boat crews identified carp using side-scan sonar and visual observations. Deployed gill nets were monitored at all times. All species caught during removal efforts were documented. Native species were released immediately. Invasive carp were removed from the gear and euthanized. All invasive carp were disposed of in the main channel or deepest portion of the waterbody being fished. Invasive carp removed from National Wildlife Refuge (NWR) waters were disposed of in the main river channel outside of the NWR, per USFWS request. Total lengths and weights were recorded from a subsample of Silver Carp at each location fished, and for all Bighead, Black, and Grass Carp. Data collected for each net set included GPS location, species caught, observed mortality of by-catch species, date, time in, time out, river gauge reading, water clarity, water temperature, and cloud cover.

Results and Discussion:

Arkansas-Red-White River Sub-basin (ARW)

AGFC's Invasive Carp Removal Program staff sampled a total of 36 days and worked 1,360 hours in ARW Sub-basin waters during 2024. A total of 3,493 invasive carp weighing 55,760 pounds were removed. Removal totals of invasive carp species included Silver Carp (n=3,248; 50,726 lbs.), Bighead Carp (n=199; 4,002 lbs.), Grass Carp (n= 46; 1,032 lbs.). No Black Carp were caught in the ARW Sub-basin. A total of 41.3 miles of gill net, or 727 (100-yard) nets were fished. The mean catch rate of invasive carp was 4.8 per 100 yards of gill net. Mean length of Silver Carp removed from the Arkansas and White rivers were 976 mm and 867 mm respectively. Mean total length of Bighead Carp removed from the Arkansas and White rivers were 1,221 mm and 928 mm respectively (Figure 3).

A total of 1,350 native fishes were captured during netting efforts, with an observed mortality of 4 individuals (0.29%). A 1.6% mortality rate was observed for Paddlefish, with three mortalities occurring out of a total of 180 individuals. Paddlefish were the only species of greatest conservation need in Arkansas that had observed mortality. Using active gill netting methods significantly reduced the likelihood of by-catch mortality.

Lower Mississippi River Sub-basin (LMR)

AGFC's Invasive Carp Removal Program staff sampled a total of 123 days and worked 4,580 hours in LMR Sub-basin waters during 2024. A total of 10,170 invasive carp weighing 156,631 pounds were removed. Removal totals of invasive carp species included Silver Carp (n=69,476; 141,686 lbs.), Bighead Carp (n=515; 11,156 lbs.), Grass Carp (n= 179; 3,789 lbs.). No Black Carp were caught in the LMR Sub-basin. A total of 154.9 miles of gill net, or 2,726 (100-yard) nets were fished. The mean catch rate of invasive carp was 4 per 100 yards of gill net. Mean total length of Silver Carp removed from the Arkansas and White rivers were 879 mm and 862 mm respectively. Mean total length of Bighead Carp removed from the Arkansas and White rivers were 966 mm and 970 mm respectively (Figure 4).

A total of 5,203 native fishes were captured during netting efforts, with an observed mortality of 19 individuals (0.37%). A 1.5% mortality rate was observed for Paddlefish, with 12 mortalities occurring out of 774 individuals. Paddlefish were the only species of greatest conservation need in Arkansas that had observed mortality. Using active gill netting methods significantly reduced the likelihood of by-catch mortality.

Tables and Figures:

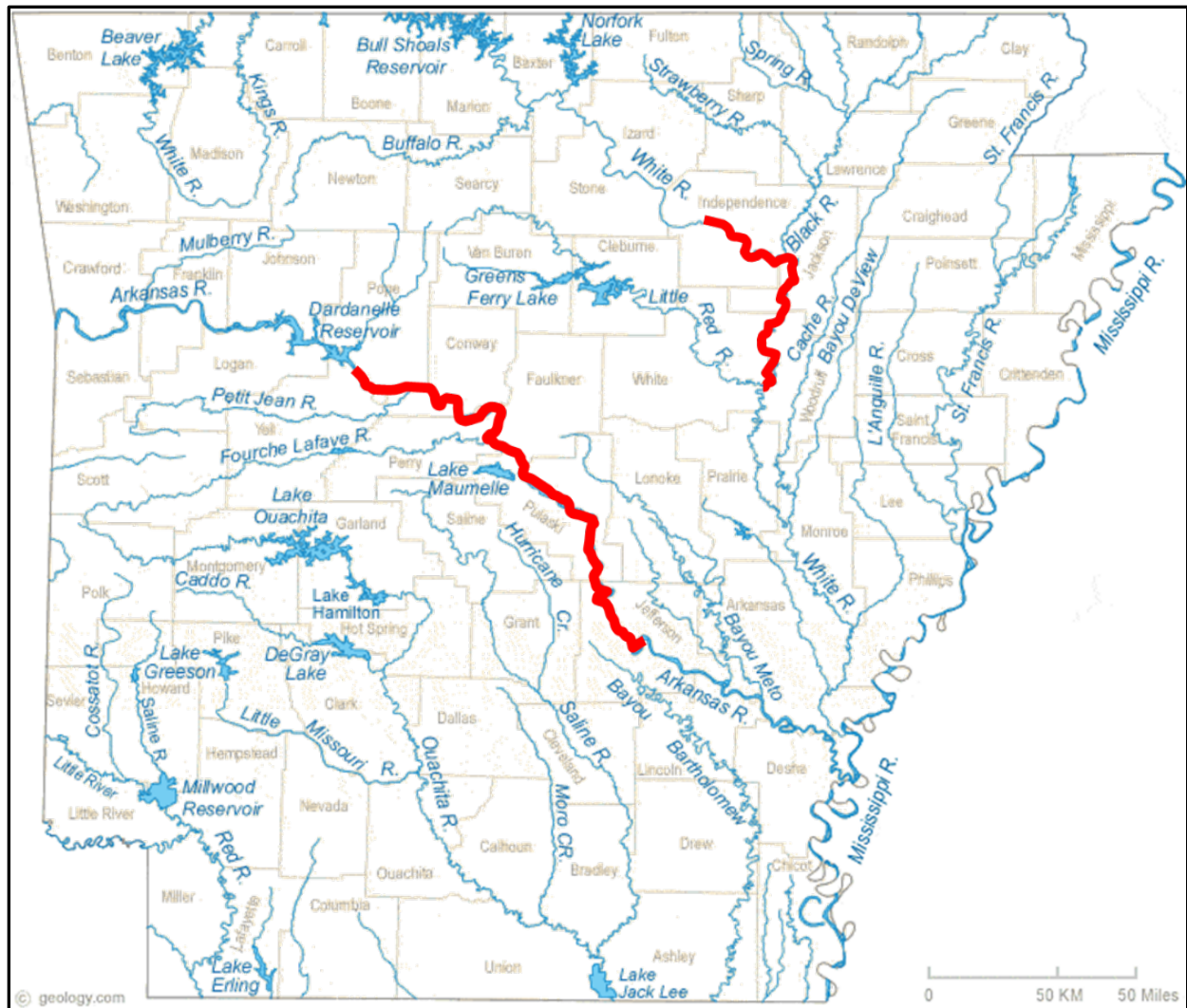


Figure 1. Map illustrating reaches of the Arkansas and White Rivers, within the ARW Sub-basins, where targeted removal of invasive carp was conducted by the AGFC Invasive Carp Removal Program from January - December 2024. Focus area is represented by red lines.

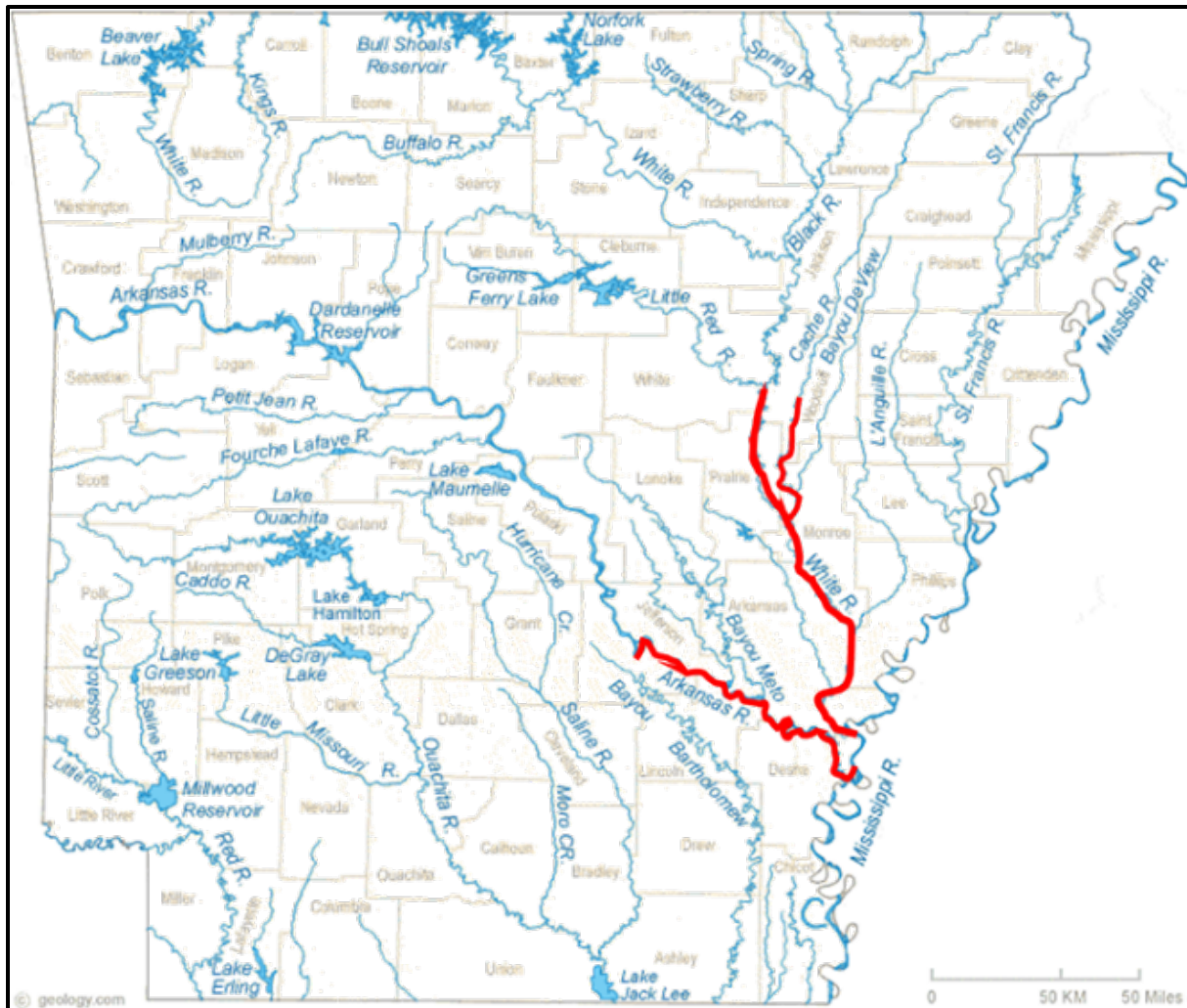


Figure 2. Map illustrating reaches of the Arkansas and White Rivers, within the LMR Sub-basins, where targeted removal of invasive carp was conducted by the AGFC Invasive Carp Removal Program from January - December, 2024. Focus area is represented by red lines.

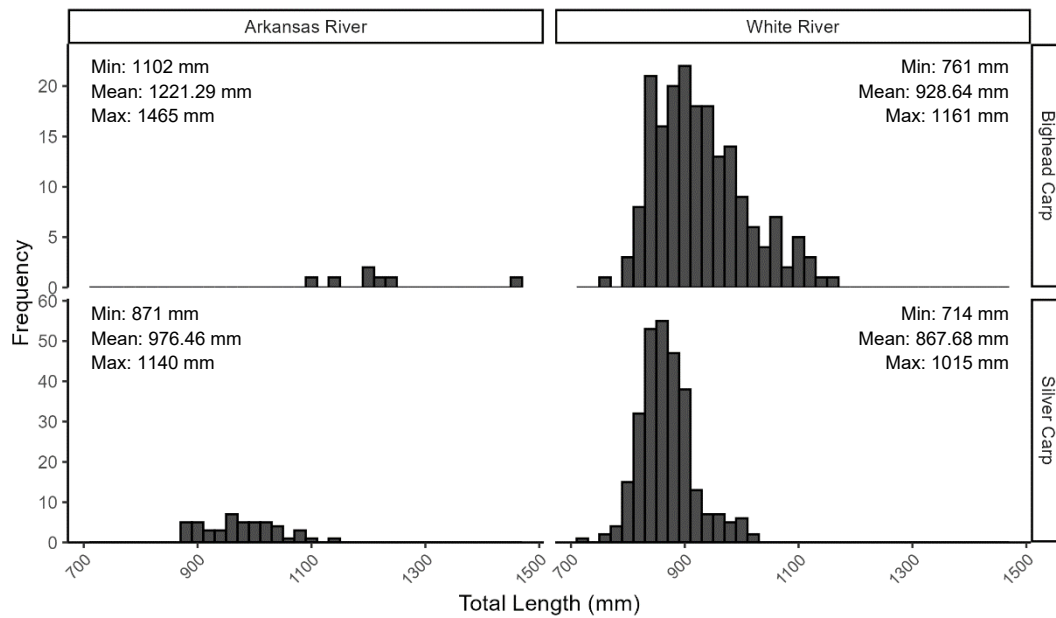


Figure 3. Length frequency histogram of Bighead and Silver Carp captured in the Arkansas-Red-White Sub-basin in Arkansas by the AGFC Invasive Carp Removal Program in 2024. Scales differ on y-axis to account for low captures of Bighead Carp.

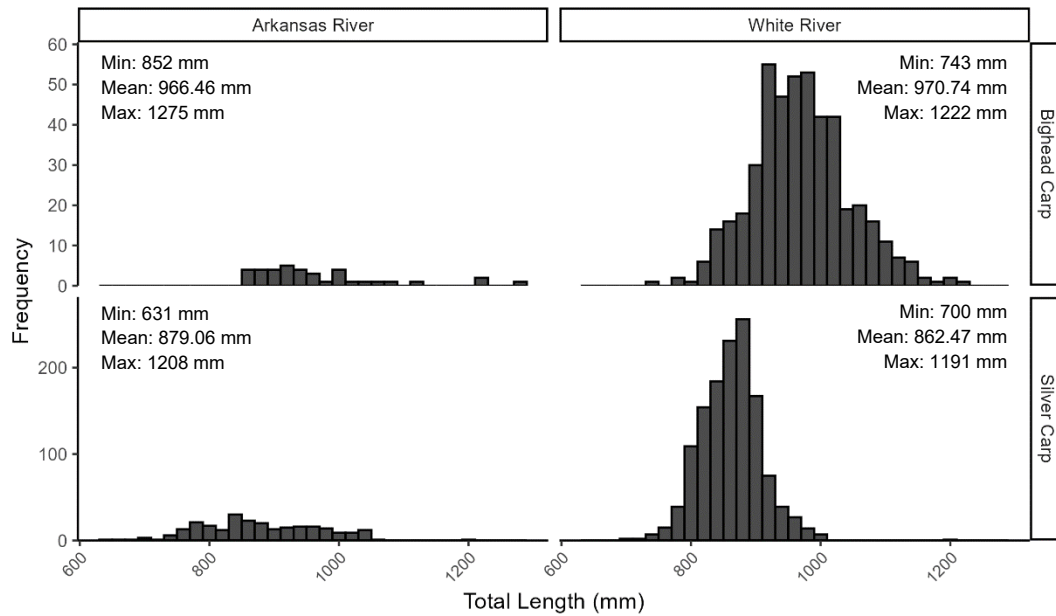


Figure 4. Length frequency histogram of Bighead and Silver Carp captured in the Lower Mississippi River Sub-basin in Arkansas by the AGFC Invasive Carp Removal Program in 2024. Scales differ on y-axis to account for low captures of Bighead Carp.

Recommendations:

- Continue to support agency removal efforts within the LMR and ARW Sub-basin portions of the Arkansas and White River systems in Arkansas to reduce biomass and slow range expansion in these leading-edge populations.
- Pilot sampling approaches for Black Carp in the LMR Sub-basin portion of the White River, where they are known to occur, to inform the development of monitoring strategies in Arkansas.

AGFC - LMR SUB-BASIN RESEARCH PROJECT CONDUCTED BY UAPB

Project Title: Juvenile recruitment and habitat use of Silver Carp in the lower Arkansas and lower White Rivers

Geographic Location: Lower Arkansas River (Pool 4 to Pool 2 and the Arkansas Post Canal) and Lower White River (from Des Arc to the confluence of the White and Mississippi Rivers).

Lead Author, Agency, and Contact Information: Matt Horton, Arkansas Game and Fish Commission, Matthew.Horton@agfc.ar.gov

Participating Agencies: University of Arkansas at Pine Bluff

Statement of Need:

According to the National Plan Goals and Strategies, Strategy 3.6.1. is to “Develop sampling gears and monitoring methods for all life stages of Asian carps in both standing and flowing water environments.” While there is anecdotal information to support juvenile recruitment of Silver Carp in the lower White River, no specific sampling effort has produced solid evidence of recruitment of late-stage larvae or early-stage juveniles to backwater habitats in the Lower White River or Lower Arkansas River. This research project specifically addresses this data gap. Identifying backwater habitats where recruitment of juvenile Silver and Bighead Carp occurs can help inform future management, such as targeted removal, of these species.

The University of Arkansas at Pine Bluff has conducted fieldwork in the Lower Arkansas River and Lower White River during a previous research project. Adult Silver Carp and Bighead Carp were collected in both rivers, and gravid females were confirmed in both systems. However, previous sampling gears did not include those proposed herein. Furthermore, sampling did not specifically target mid to late summer and early fall, times when early juveniles would be recruiting to backwater habitats. Such activities are proposed in this project.

In addition to Strategy 3.6.1, the National Plan includes Strategy 3.6.2. which reads “Assemble information about the distribution, biology, life history, and population dynamics of bighead, black, grass, and silver carps.” This research project addresses this strategy and would provide specific distribution data for early life history stages of Silver Carp, and possibly Bighead Carp, in Arkansas.

Project Objectives:

- 1) Monitor young of year fish and small-bodied fishes in backwaters of the lower Arkansas and lower White Rivers during periods of likely Silver Carp spawning to document Silver Carp juvenile recruitment and backwater habitat use in Arkansas.
- 2) Use otolith microstructure to document growth rates of juvenile Silver Carp relative to various backwater habitats of the lower Arkansas and lower White Rivers.
- 3) Use otolith microchemistry to infer natal spawning systems of juvenile Silver Carp collected in backwaters of the lower Arkansas and lower White Rivers.

Project Highlights:

- Nine juvenile Silver Carp were collected with seines from two sites of the lower White River in August. No juveniles were collected from the lower Arkansas River. No juveniles were collected with mini-fyke nets.
- Of the 30 sample sites in the lower Arkansas and White Rivers, only 22 sites were able to be sample with seines for occupancy modeling.
- The use of the two gear types we employed (seines and mini-fyke nets) could be affecting catch rates.
- During the second field season (August-October 2025), we are considering a gear comparison study using seines, modified mini-fyke nets, and centipede nets that could add a sample gear to the toolbox of biologists tasked with monitoring juvenile Silver Carp in backwaters.

Methods:

AGFC executed the project contract with UAPB in July 2024. Backwater habitat in the lower Arkansas and White Rivers was characterized according to depth, velocity and substrate type (per Haupt and Phelps 2016) and according to the backwater habitat classification scheme of Baker et al. (1991). “Quiet backwater” habitats where juvenile Silver Carp are likely to occupy were identified in the lower Arkansas and White Rivers, based on water temperatures, discharge rates, associated water velocities and Critical Thermal Units (CTUs) necessary for Silver Carp eggs to hatch, and larvae to reach swim bladder inflation stage and actively move to backwater nursery habitats (per Chapman and George 2011; George and Chapman 2023). Only backwaters connected to the main channel below flood stage during falling river conditions would likely be occupied by early-stage juvenile Silver Carp. Based on these criteria, 30 sites were included in the planned census of backwater habitat (Table 1).

We adopted an occupancy model approach to sampling juvenile Silver Carp. We attempted to survey each site three times (in August, September, and October) during the 2024 field season. The sampling gears used were a combination of mini-fyke nets and minnow seines, depending upon local conditions. To sample backwaters that were accessible by boat but not seizable, we employed modified mini-fyke nets. When modified mini-fyke nets were used, three nets were set at each site. The modified mini-fyke nets had two rectangular frames that were 0.7 m high, 1.2 m

wide, spaced 0.4 m apart. The nets also had two 0.6-m diameter metal hoops spaced 0.5 m apart. The 2-m lead and the net itself were comprised of 0.7-cm bar mesh. Seine surveys consisted of three semi-circular seine hauls with a 25-ft, ¼-inch knotless nylon mesh seine. All bigheaded carp collected were identified, enumerated, and preserved for further analyses. All other species were identified, enumerated, and returned to the system. Sample site covariates were recorded including river and macrohabitat (channel, pool, natural steep bank, lotic sandbar, lentic sandbar, revetment). Survey covariates were recorded including depth, temperature, sediment type (sand, silt, mud), and vegetation cover (much, some, none).

Results and Discussion:

Of the 30 sample sites selected, five could not be seined in August, six in September, and eight in October (Table 1). In some instances, water levels were not sufficient to allow boat access to the backwater. In other instances, water hyacinth, American lotus, and other emergent vegetation completely covered the shoreline and extended into the water ten to twenty feet from shore, making seining impossible. Hence, the occupancy sample design included 10 sites in the White River and 12 sites in the Arkansas River during the first field season. Mini-fyke nets were used at sites that could not be sampled with seines but could be accessed by boat, which included four sites in August, three sites in September, and four sites in October (Table 1). Seine data and mini-fyke net data were summarized and analyzed separately.

During the 2024 field season, nine juvenile Silver Carp were collected with seines from two sites of the lower White River. Six Silver Carp were collected in Anderson Bay, and three Silver Carp were collected in Big Island Chute Bottom in August (Figure 1). No juveniles were collected from the lower Arkansas River. No juveniles were collected with mini-fyke nets. The Silver Carp naïve occupancy rate was 0.09 for the 2024 field season. The nine Silver Carp ranged in size from 18 to 33 mm. Those fish are preserved and are awaiting otolith extraction and microchemistry analysis.

A total of 33,446 small-bodied fish were collected with seines during the 2024 field season (Table 2). The most abundant species were Mississippi Silverside, followed closely by Weed Shiner, Mosquitofish, and Emerald Shiner, respectively.

Our intention to survey 30 backwaters in the lower Arkansas River and lower White River with seines was thwarted by low water, dense vegetation, and thick mud (1-3 ft deep) which complicated or prohibited the seining process. We were able to sample 22 sites with seines for occupancy modeling. However, an actual occupancy analysis will be challenged by the low number of sites occupied by Silver Carp.

Fluctuating and low water levels, especially in the free-flowing Arkansas River below Wilbur D. Mills dam, affected our ability to move in the river, access backwaters, and sample with seines. Collection methods that have been successful in other systems and habitat (dozer trawl, boat electrofishing) would be challenging at many of our sites. The use of the two gear types we employed could be affecting catch rates.

To address the issue of juvenile Silver Carp catchability, we are considering a gear comparison

study during the second field season (August-October 2025). Centipede nets (Figure 2), a gear utilized by fishers in southeast Asian swamps, has been successfully employed to sample fish in mangrove habitat in Costa Rica (Scholten 2024). This gear seems ideal for complex habitat such as the densely-vegetated backwaters in the lower Arkansas and White Rivers. We are considering comparing seines, modified mini-fyke nets, and centipede nets in a one-way analysis of variance study that could add a sample gear to the toolbox of biologists tasked with monitoring juvenile Silver Carp in backwaters.

Tables and Figures:

Table 1. *Sites on the lower Arkansas River and lower White River which were originally included in a planned census of backwaters. In each month, 0 means the site could not be sampled, 1 means the site was sampled with a seine, and 2 means the site was sampled with a modified mini-fyke net.*

River	Site	GPS Coordinates	Aug	Sep	Oct
White	Roc Roe Bay	34°37'15.45"N, 91°20'33.08"W	1	1	1
	Johnson Bay	34°31'39.26"N, 91°16'22.00"W	0	0	0
	Johnson Bluff	34°31'40.83"N, 91°15'40.90"W	1	1	1
	Anderson Bay	34°23'33.90"N, 91° 8'13.04"W	1	1	1
	Big Island Chute Top	34°20'39.07"N, 91° 5'48.44"W	1	1	1
	Indian Bayou	34°20'34.34"N, 91° 3'33.56"W	1	1	1
	Big Island Chute Bottom	34°15'19.73"N, 91° 4'37.73"W	1	1	1
	Bradley Bayou	34°11'38.92"N, 91° 5'39.80"W	1	1	1
	LaGrue Bayou	34° 5'54.42"N, 91° 9'58.58"W	1	1	1
	Jack's Bay	34° 5'52.16"N, 91°10'4.99"W	1	1	1
Arkansas	Poverty Point	33°57'33.68"N, 91° 8'13.05"W	1	1	1
	Lock and Dam 5	34°24'25.04"N, 92° 5'56.66"W	1	1	1
	Honey Hole	34°16'32.48"N, 91°59'29.98"W	1	1	1
	Finger Coves	34°17'20.31"N, 91°55'41.98"W	2	2	2
	Lake Langhoffer	34°14'22.72"N, 91°59'1.62"W	1	1	1
	Shepherd Island	34°14'5.69"N, 91°53'11.80"W	1	1	1
	Pool 3 Mulberry Grove	34°12'39.10"N, 91°48'31.41"W	1	1	1
	Pool 3 Trulock Bend	34°12'21.18"N, 91°47'23.18"W	1	1	1
	Rising Star	34°10'7.12"N, 91°44'45.81"W	1	1	1
	Huffs Island	34° 9'23.28"N, 91°40'20.57"W	1	1	1
	Little Bayou Meto	34° 7'12.49"N, 91°35'57.82"W	1	1	1
	Taylor Old River	34° 3'40.37"N, 91°28'15.03"W	1	1	1
	Coal Pile	33°58'29.88"N, 91°24'46.40"W	2	0	2
	Moore Bayou	34° 0'35.28"N, 91°20'33.57"W	2	2	2
	Arkansas Post Canal	34° 1'18.73"N, 91°19'22.87"W	2	2	2
	Lake Merrisach	34° 1'51.67"N, 91°16'27.47"W	1	1	1
	Morgan Point	33°58'49.76"N, 91°19'22.45"W	1	1	1
	Medina Cove	33°57'41.96"N, 91°15'42.59"W	1	0	0
	House Bend	33°57'40.52"N, 91°10'2.05"W	1	1	0
	Sawmill Bend Cutoff	33°51'59.61"N, 91° 7'31.41"W	1	1	0

Table 2. *Small-bodied fish collected with seines in backwater habitats of the lower Arkansas River and lower White River during the period August-October 2024.*

Species	Arkansas			White		
	Aug.	Sep.	Oct.	Aug.	Sep.	Oct.
Banded Pygmy Sunfish	0	0	0	2	0	0
Bantam Sunfish	1	0	0	0	0	0
Blackspotted Topminnow	7	1	0	26	1	16
Blackstripe Topminnow	7	9	8	21	25	12
Black Crappie	2	1	0	2	9	4
Blacktail Shiner	71	642	284	25	394	2123
Bluegill	294	217	115	51	97	235
Bluntnose Darter	0	0	0	1	17	19
Bullhead Minnow	20	143	18	13	84	235
Channel Catfish	0	0	0	3	1	0
Common Carp	1	0	0	0	0	0
Creek Chub	1	0	0	6	0	0
Cypress Darter	0	0	0	0	0	5
Emerald Shiner	34	153	19	503	2205	2231
Flathead Catfish	0	1	0	0	0	0
Flier	0	0	0	0	1	0
Freshwater Drum	0	1	0	0	0	0
Gizzard Shad	42	55	2	37	15	0
Golden Topminnow	8	6	6	0	0	0
Green Sunfish	2	0	0	8	0	0
Largemouth Bass	9	3	0	12	5	5
Logperch	0	0	0	0	0	0
Longear Sunfish	7	4	0	0	1	0
Mississippi Silverside	2350	3874	1150	560	130	66
Mosquitofish	519	1132	617	468	625	2215
Mud Darter	0	0	0	0	0	0
Orangespotted Sunfish	2	4	0	31	175	55
Redspotted Sunfish	0	0	0	0	0	0
Redear Sunfish	0	0	1	0	0	0
River Carpsucker	1	0	0	1	0	0
Sand Darter	0	0	0	5	2	0
Slough Darter	0	0	0	0	0	3
Silver Carp	0	0	0	9	0	0
Silver Chub	0	2	0	0	0	85
Skipjack Herring	1	0	0	0	0	0
Spotted Bass	1	0	0	4	0	0
Taillight Shiner	0	0	0	0	0	0
Threadfin Shad	673	389	0	11	44	38
Weed Shiner	1600	18	48	3594	1463	819
Warmouth	1	0	0	0	0	3
White Bass	2	1	0	0	0	0
White Crappie	1	0	0	1	4	4

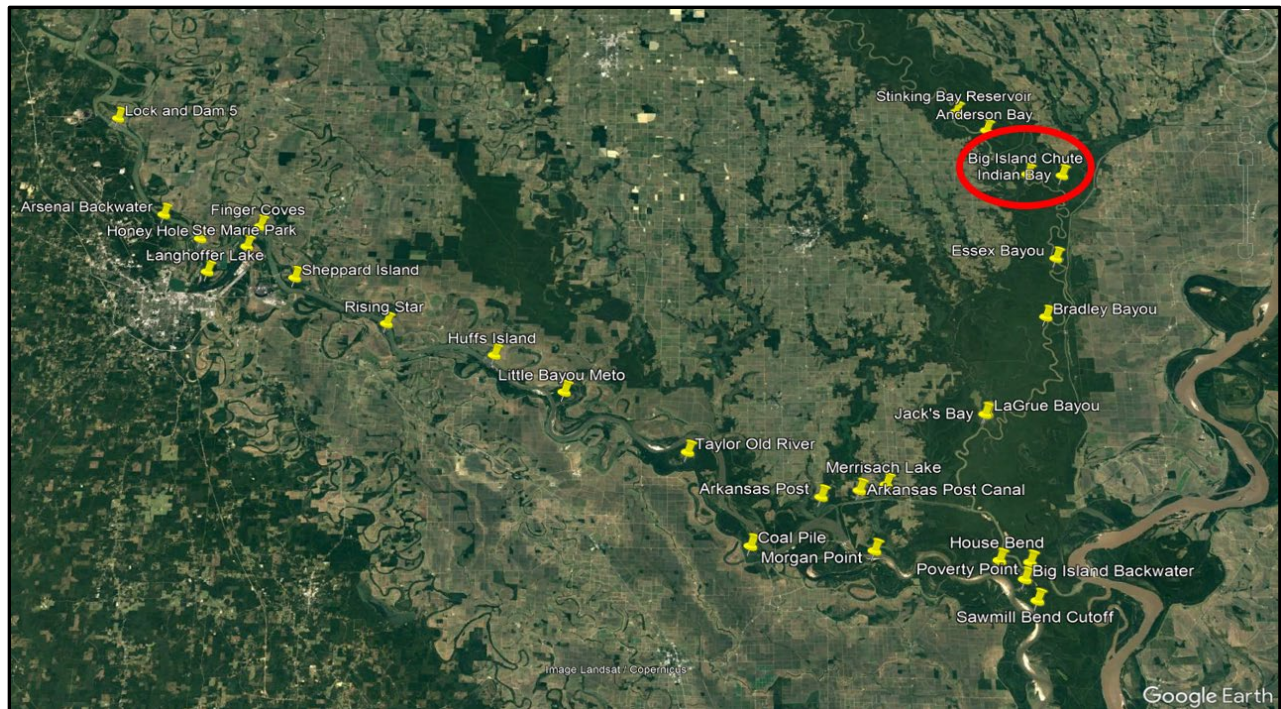


Figure 1. Sample sites (indicated with yellow pins) selected to seine or net for juvenile Silver Carp in the lower Arkansas and White Rivers, in Arkansas. The red circle contains the only two sites (Big Island Chute and Indian Bay) where juvenile Silver Carp were collected during surveys in 2024.



Figure 2. Figure 1. Top-down view of a centipede net, showing the alternating side entrances and tied-off ends of the net. Net is 2.4-m long with ten 20-cm x 25-cm rectangular frames. Photo credit: Tanner Scholten.

Recommendations:

- Continue to sample the same selected backwater habitats in the lower Arkansas and White Rivers during the second field season (August-October 2025).
- Conduct a gear comparison study during the second field season, using seines, modified mini-fyke nets, and centipede nets to address the issue of juvenile Silver Carp catchability and determine effectiveness of centipede nets for sampling juvenile Silver Carp in backwater habitats.

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