Project Title: Population Management of Invasive Carp in the Missouri River Basin

(formerly submitted as Control and Containment of Invasive Carp in the Missouri River Basin)

Lead Author, Agency, and Contact Information:

- Kansas Department of Wildlife and Parks (KDWP)
  - Liam Odell liam.odell@ks.gov

Participating Agencies:

- Missouri Department of Conservation (MDC)
  - Joe McMullen joe.mcmullen@mdc.mo.gov
  - Kasey Whiteman kasey.whiteman@mdc.mo.gov
  - Adam McDaniel adam.mcdaniel@mdc.mo.gov
- Kansas Department of Wildlife and Parks (KDWP)
  - Chris Steffen chris.steffen@ks.gov

Statement of Need: Populations of invasive carp (silver carp, bighead carp, black carp, and grass carp) have rapidly expanded throughout the Mississippi River basin. Management and control of invasive carp is necessary to reduce their impact on native species, the ecosystem, and the economy. In response to these threats, many states throughout the Mississippi and Great Lakes basins are working to find effective strategies to manage existing populations and to control the expansion of invasive carp into adjacent aquatic systems. Appropriations for the Department of Interior indicate that 'while the Committees (House Subcommittee on Interior, environment, and Related Agencies and the Senate Subcommittee on Interior, Environment, and Related Agencies) recognize the importance of studying and understanding invasive carp patterns, the Service is encouraged to take action on a strategy that increases the focus on biomass removal and restricts carp progression by coordinating with other Federal partners on constructing invasive carp barriers'. These projects are focused on the priorities identified by Congress, namely biomass removal and barrier construction.

Projects:

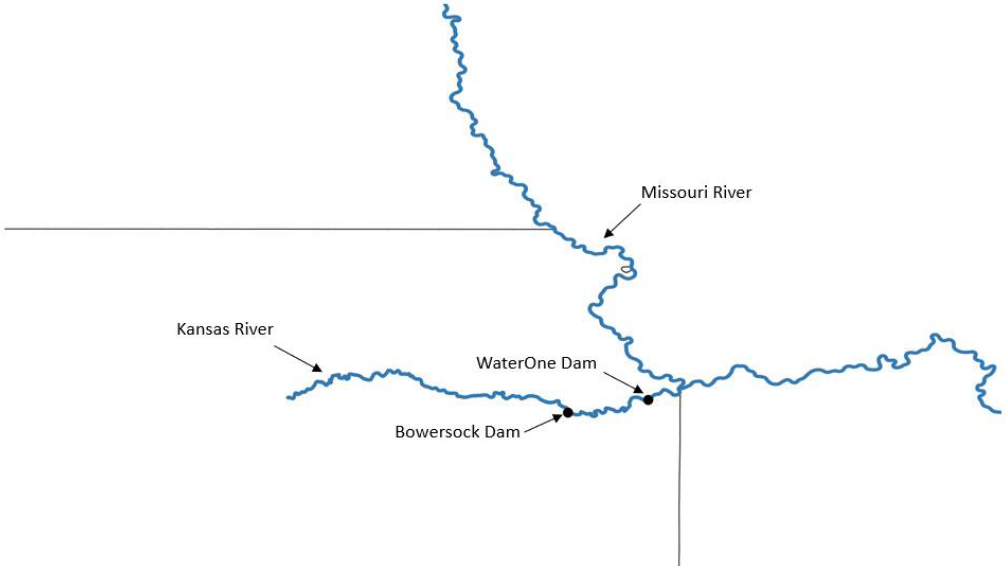
1) Kansas River Invasive Carp Removal (Appendix 1)
2) Lamine and Platte River (MO) Invasive Carp Removal (Appendix 2)
3) Control and Containment of Invasive carp in the Missouri River Basin (Appendix 3)

Appendix 1: Kansas River Invasive Carp Removal

Lead Author, Agency, and Contact Information: Kansas Department of Wildlife and Parks (KDWP), Chris Steffen (chris.steffen@ks.gov), Liam Odell (liam.odell@ks.gov)

Participating Agencies: NA

Location of Activities: Kansas River downstream of Bowersock Dam



Populations of invasive carp (silver carp, bighead carp, black carp, and grass carp) have rapidly expanded throughout the Mississippi River basin. The feeding habits and population densities of invasive carps cause significant ecological harm where populations become established resulting in diminished opportunities for fishing (recreational and commercial), boating, and other wildlife-associated recreation which in turn have significant negative economic impacts. Management and control of invasive carp is necessary to reduce their impact on native species, the ecosystem, and the economy.

In response to these threats, many states throughout the Mississippi and Great Lakes basins have been working to find effective strategies to manage existing populations and to control the expansion of invasive carp into adjacent aquatic systems. Appropriations for the Department of Interior indicate that ‘while the Committees (House Subcommittee on Interior, environment, and Related Agencies and the Senate Subcommittee on Interior, Environment, and Related Agencies) recognize the importance of studying and understanding invasive carp patterns, the Service is encouraged to take action on a strategy that increases the focus on biomass removal and restricts carp progression by coordinating with other Federal partners on constructing invasive carp deterrents’. The objective of this project aligns with this and focuses on invasive carp removal in the lower Kansas River.

Kansas River

The Kansas River drains the North half of the state of Kansas and a portion of South-central Nebraska and flows East to its confluence with the Missouri River at Kansas City, Kansas. The Kansas River is one of only three publicly accessible, navigable waterways in the state of Kansas and, along with several large reservoirs located in the basin, is highly utilized for outdoor recreation such as fishing, boating, nature watching, etc. Bighead carp were first documented in the Kansas River in 1987 and silver carp in 1991.

Invasive carp have been largely prevented from invading the upper Kansas River by the Bowersock Dam at RKM 84 in Lawrence, Kansas. Only six bighead carp have been documented upstream of this structure as the Bowersock Dam prevents upstream movement of invasive carp except under extraordinarily high flow conditions. KDWP routinely samples for invasive carp upstream of the Bowersock Dam and has found no evidence of a breeding population of invasive carp in the upper Kansas River. KDWP is working to keep the Kansas River upstream of Bowersock Dam free of invasive carp by using Fish and Wildlife Service grant funding to install a deterrent to prevent upstream movement of carp at the dam under high flow conditions.

In addition to the Bowersock Dam, downstream there is a semi-passable barrier, WaterOne Weir, at RKM 24 in Edwardsville, KS. The WaterOne Weir limits upstream movement of invasive carp at the location under most flow conditions, however some limited movement past the weir does occur at one to three year intervals. Removing invasive carp from the lower Kansas River is needed to both reduce the risk of invasive carp spreading into the uninvaded portion of the Kansas River upstream of the Bowersock Dam and to reduce invasive carp abundances in the lower Kansas River to benefit native species, anglers, river users, Kansans, and economic interests tied to the health of the river.

Project Objectives:

1. Remove invasive carp downstream of Bowersock Dam to protect upstream waters and reduce invasive carp and their impacts in the lower Kansas River.

Project Highlights:

- 16,722 kg of invasive carp were removed from Kansas River downstream of Bowersock Dam
- Removal efforts were expanded in comparison to previous years to include not only the 60 kilometers from the Bowersock Dam to the WaterOne Weir but also the 24 kilometers the Kansas River from the WaterOne Weir to the confluence with the Missouri River
- Found notable differences in silver carp demographics between Kansas River sites where disparate amounts of invasive carp removal have occurred and an unfished site on the Missouri River.

Methods

Objective 1

In 2025, KDWP conducted invasive carp removal efforts using gill nets, traditional boat electrofishing, and electrified dozer trawling. Removal efforts were diverse and incorporated all three methods singly or in combination depending on conditions such as season, water temperature, flow, weather, and staff availability. Beginning May 2025, KDWP greatly increased removal efforts downstream of the WaterOne Weir compared to previous years.

Gill nets were deployed in multiple configurations, including "whip sets" (spiral formations; Figure 1) and "J" sets deployed parallel to riverbanks (Figure 2). The most used nets were floating-style gill nets with 4-inch and 3½-inch mesh; measuring 12 feet in height, hobbled to 10 feet deep; and ranging from 200 to 300 yards in length. KDWP also experimented with smaller 2-inch mesh sizes and using an electrofishing boat to herd invasive carp into gill-nets.

Electrofishing and electrified dozer trawling were typically conducted using 45-Hz pulsed DC settings. Standard boat electrofishing was conducted by both individual boat efforts and "raptor pack" methods utilizing multiple standard electrofishing boats working together to surround and capture schools of invasive carp. Electrified dozer trawl runs lasting 15–20 minutes were conducted and proved to be an effective method for invasive carp removal. The addition of the electrified dozer trawl provided KDWP with a highly effective invasive carp tool well-suited to the conditions of the Kansas River downstream of Bowersock Dam.

To help gauge the impacts of invasive carp removal efforts, KDWP collected silver carp demographic data from three locations for comparison: the Kansas River upstream of the WaterOne Weir, the Kansas River downstream of the WaterOne Weir, and the Missouri River at Atchison, Kansas. Sampling was conducted from April 4–17, 2024, using standard electrofishing, with 100 randomly selected fish collected from each location.

Results and Discussion:

Objective 1

In 2025, a total of 16,722 kg of invasive carp were removed from the Kansas River downstream of Bowersock. Of this total, 13,881 kg were removed from the reach downstream of the WaterOne Weir, and 2,840 kg were removed upstream of the WaterOne Weir. KDWP staff was responsible for 100% of invasive carp removal efforts conducted. Of the total invasive carp biomass removed, 9,300 kg were collected using electrified dozer trawling, 4,425 kg using standard electrofishing, and 3,001 kg using gill nets (Figure 3). The electrified dozer trawl was the most effective removal tool used by KDWP in 2025.

KDWP conducted more multi-day, multi-gear removal efforts in 2025 than in 2024. The most common multi-gear configuration paired a standard electrofishing boat with gill nets. Typically, gill nets were deployed in a "J" configuration, while the electrofishing boat was used to herd invasive carp into the nets and to dip-net carp that jumped during electrofishing runs. These combined efforts accounted for 2,047 kg of invasive carp removed.

Successful capture and removal of invasive carp was more consistent throughout 2025 compared to previous years, other than a slow start in 2025 due to an extended winter. In 2023 and 2024, successful capture and removal of invasive carp were largely concentrated in the spring and fall. However, in 2025, the electrified dozer trawl greatly increased invasive carp capture and removal in the summer months when other gears have been less effective in the past (Figure 4). Both the electrified dozer trawl and gill nets resulted in some bycatch, with gizzard shad and smallmouth buffalo, respectively, being the most common bycatch species (Table 1).

In spring 2025, KDWP conducted demographic comparisons of invasive carp from three locations (Figure 5) to evaluate differences between a treatment population (Kansas River upstream of the WaterOne Weir) and two control populations (Kansas River downstream of the WaterOne Weir [which was only minimally fished prior to May 2025] and the Missouri River at Atchison, Kansas). Evaluations conducted in 2023 and 2024 indicated that the size structure of the treatment population had shifted toward slightly larger fish compared to the control populations. The same evaluations were conducted in 2025 (Figures 6, 8, and 10), and differences within the treatment population among 2023, 2024, and 2025 were also assessed (Figures 7, 9, and 11).

Silver carp from the treatment population continued to reach greater lengths than those from the two control populations (Figure 6). Fish sampled in 2025 were generally smaller than those sampled in 2024 but remained larger than those sampled in 2023 (Figure 7). The continued increase in silver carp length suggests that removal efforts are influencing growth within the treatment population upstream of the WaterOne Weir. However, the decrease in length observed between 2024 and 2025 may be attributable to elevated river flows in 2025, which may have facilitated upstream movement of smaller silver carp from downstream of the weir.

Silver carp from the treatment population did exhibit faster growth to larger sizes than those from the two control populations in 2025 (Figure 8). Differences in growth within the treatment

population among 2023, 2024, and 2025 were measurable between 2023 vs 2024 and 2025. Notably, silver carp sampled in 2025 did not reach maturity at the longer lengths observed in 2024 (Figure 9). Continued demographic evaluation of silver carp removed from upstream of the WaterOne Weir throughout the duration of the project will provide greater resolution of these trends.

In 2025, silver carp from the treatment population were longer and heavier than those from the two control populations; however, there was no clear indication that growth rates were faster in the treatment population (Figure 10). Similar patterns were observed across years, although silver carp sampled in 2025 were slightly smaller than those sampled in 2024 (Figure 11). Overall, comparisons among locations and years suggest that KDWP removal efforts continue to influence silver carp body condition within treatment areas and across years. The smaller sizes observed in 2025 may reflect upstream movement of smaller individuals from downstream of the WaterOne Weir associated with elevated river flows.

Recommendations:

- Continue invasive carp removal efforts throughout the Kansas River system to reduce invasive carp abundance and benefit native species and river users.
- A formal evaluation is needed to assess and quantify the effects of the removal efforts and set future removal targets.
- KDWP should continue to seek out and develop additional gears and methods to further increase capture and removal of invasive carp.

Tables and Figures:

Figure 1: *Visual representation of a spiral whip set*

Figure 2: *Visual representation of a "J" net set.*

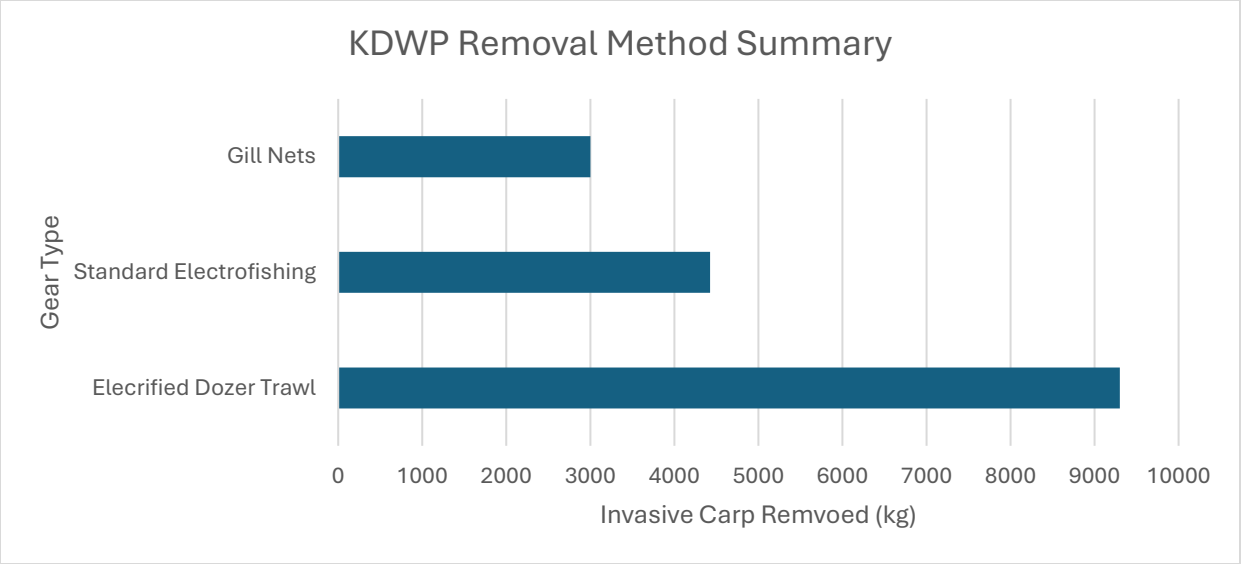


Figure 3: *Summary of invasive carp removed (kg) by gear type.*

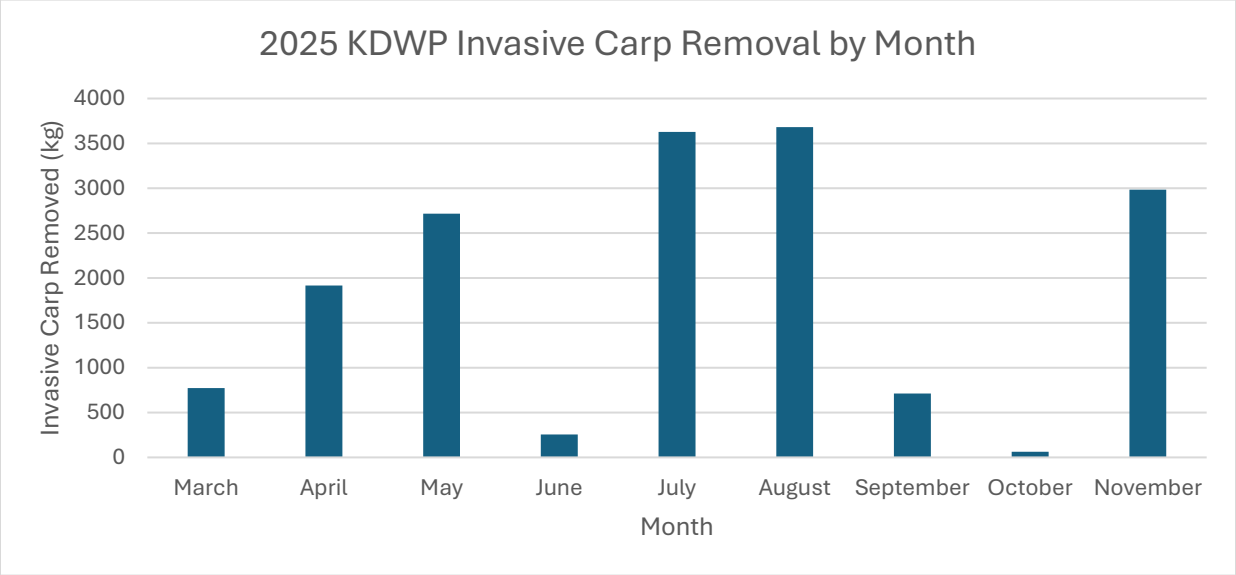


Figure 4: *Histogram of invasive carp removed (kg) per month.*

Species	Electrified Dozer Trawl	Gill Nets	Total
Gizzard Shad	609	1	610
Goldeye	106	0	106
Longnose Gar	99	5	104
Smallmouth Buffalo	96	238	334
RIVER CARPSUCKER	22	19	41
Freshwater Drum	16	3	19
Bigmouth Buffalo	15	2	17
Shortnose Gar	14	0	14
Common Carp	6	8	16
White Bass	3	0	3
Blue Catfish	2	21	23
Channel Catfish	1	6	7
Blue Sucker	1	2	3
Flathead Catfish	1	3	4
Shovelnose Sturgeon	1	12	13

Table 1: *Summary of species and count bycatch data for 2025.*

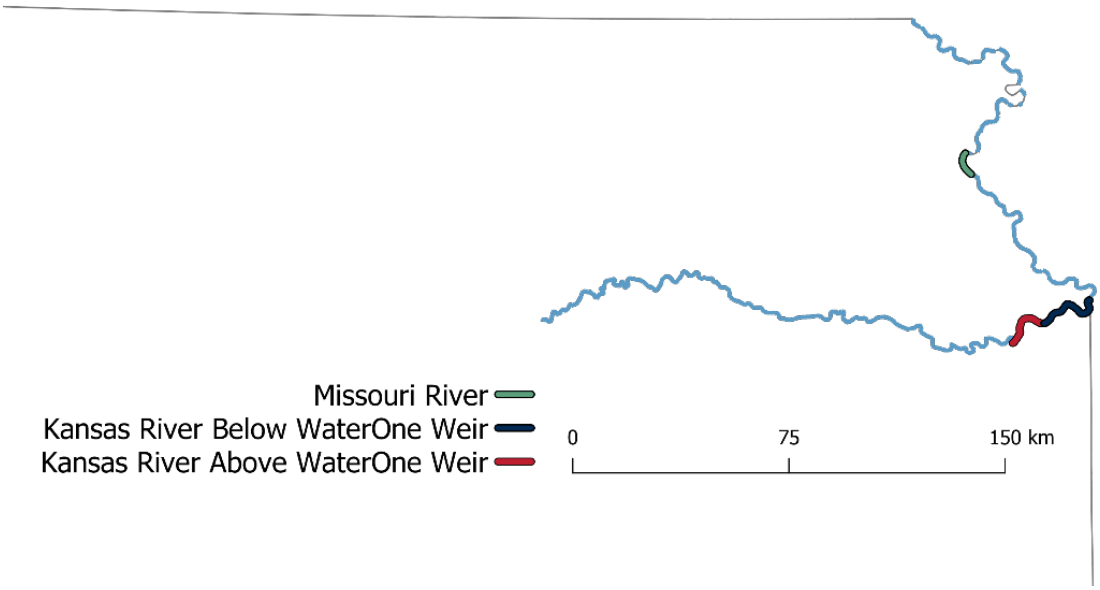


Figure 5: *Locations KDWP used for demographic comparisons between treatment populations and control populations.*

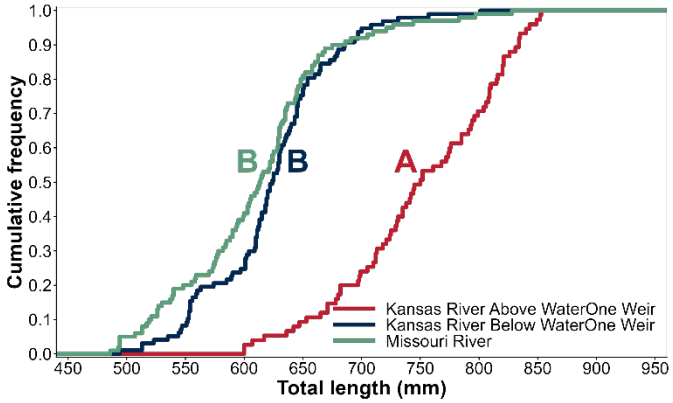


Figure 6: *Length frequency/distribution for silver carp between Kansas River above WaterOne Weir (treatment population) vs Kansas River below WaterOne Wier and Missouri River at Atchison, KS (control populations).*

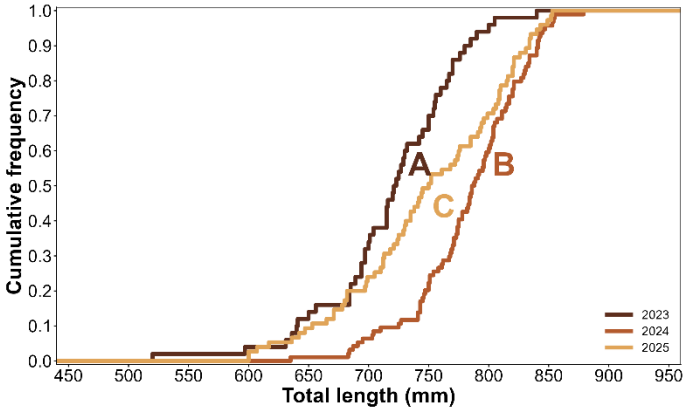


Figure 7: *Length frequency/distribution for silver carp from the Kansas River above WaterOne Weir (control location) between 2023, 2024, and 2025.*

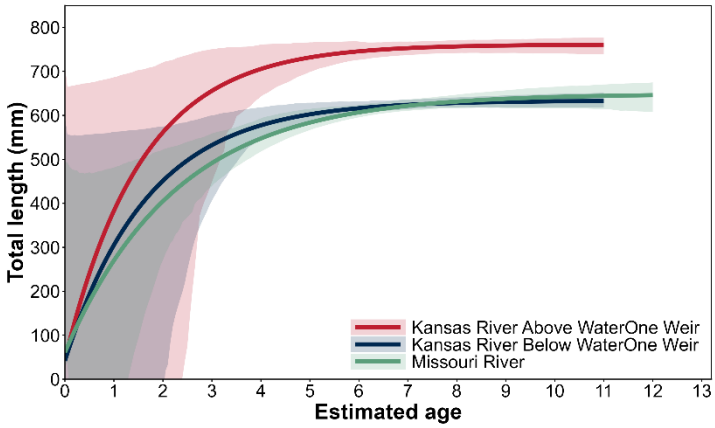


Figure 8: *Age and growth for silver carp between Kansas River above WaterOne Weir (treatment population) vs Kansas River below WaterOne Wier and Missouri River at Atchison, KS (control populations).*

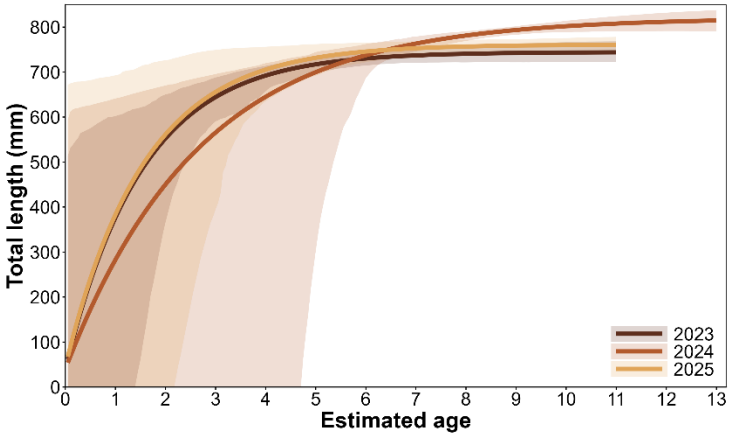


Figure 9: *Age and growth for silver carp from the Kansas River above WaterOne Weir (control location) between 2023, 2024, and 2025.*

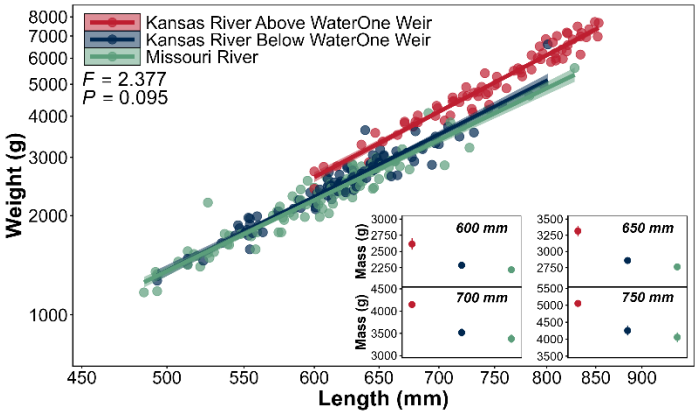


Figure 10: *Expected weight at length for silver carp between Kansas River above WaterOne Weir (treatment population) vs Kansas River below WaterOne Wier and Missouri River at Atchison, KS (control populations).*

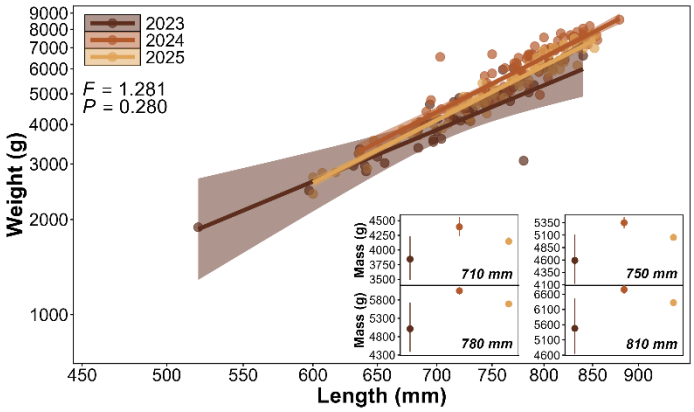


Figure 11: *Expected weight at length for silver carp from the Kansas River above WaterOne Weir (control location) between 2023, 2024, and 2025.*

References:

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Appendix 2: Lamine and Platte River (MO) Invasive Carp Removal

Lead Author, Agency, and Contact Information:
Adam McDaniel **-** Missouri Department of Conservation – Missouri River Field Station
15302 LIV 2386 Chillicothe, MO 64601

Participating Agencies:
U.S. Fish and Wildlife Service – Columbia Fish and Wildlife Conservation Office, Kansas Department of Wildlife and Parks, and USFWS – Great Plains Fish and Wildlife Conservation Office

Location of Activities:
Platte River (MO) from river kilometer 0 (confluence with Missouri River) to river kilometer 12.5. Lamine River from river kilometer 0 (confluence with Missouri River) to river kilometer 18. Missouri River mainstem river kilometer 324.3 – 327.9.

Project Highlights:

- *In September 2025, the Missouri Department of Conservation working in conjunction with the U.S. Fish & Wildlife Service – Columbia, MO and Pierre, SD and Kansas Department of Wildlife and Parks conducted intensive short-term Invasive Carp removals on the Platte River (MO) in northwest Missouri and Lamine River in central Missouri.*
- *Hydroacoustic surveys were conducted by the USFWS pre- and post-removal in the Lamine River to quantify invasive carp densities.*
- *Three gear types including boat electrofishing, dozer trawl and gill nets were utilized to remove invasive carp over the course of the two four-day sampling periods in the Platte River. Lamine River efforts utilized the three previous gears plus the paupier during four days of effort.*
- *Platte River removal efforts resulted in 7,773 Silver Carp, 28 Bighead Carp, and 101 Grass Carp weighing 18,269 kilograms (40,277 lbs.) being removed from the Platte River (MO).*
- *Lamine River removal efforts resulted in 3,982 Sliver Carp, 14 Bighead Carp, and 40 Grass Carp weighing 9,893 kilograms (21,810 lbs.) being removed from the Lamine River.*
- *Standard boat electrofishing sampling pre- and post- removal indicated Silver Carp relative abundance in the Platte River (MO) significantly decreased ($P<0.001$) with an overall 58% decrease in abundance.*
- *Hydroacoustic pre and post surveys in the Lamine River indicated Silver Carp densities decreased by 37%.*

- *No Black Carp were collected in either removal.*

Statement of Need:

Invasive species have been a major cause of deleterious impacts to native fish abundance, biodiversity, and economies. Invasive carp (including Silver, Bighead, Grass, and Black carp) have been successful invaders in the United States and have a high probability of causing negative ecological and economic effects. These four species may be impacting the food web and native fish community in the Missouri River Basin. Several studies have reported diet overlap or competition between invasive carp and native species such as Bigmouth Buffalo, Paddlefish, Freshwater Drum, catfishes, and redhorses (Schrank et al. 2003, Nico et al. 2005, and Sampson et al. 2009). Such effects have occurred in areas of the Mississippi River Basin where invasive carp populations have become established. Irons et al. (2007) reported that Bigmouth Buffalo and Gizzard Shad condition has declined since the establishment of invasive carp. Thus, extirpation of feral invasive carp populations is desired for many ecosystems.

Bighead and Silver carp are well established in the Missouri River Basin where natural resource managers are concerned that these species are causing extensive and irreversible changes to the aquatic environment. Research has shown that Bighead and Silver carp populations could potentially be recruitment overfished. One study estimated that harvesting 25% of Silver Carp greater than 300 mm total length would lead to reduced abundances in the Missouri River (Seibert et al. 2015). Still other studies estimate exploitation rates of 30% (Tripp and Phelps 2018) to 40% (ACRCC 2019) would lead to a reduction of invasive carp populations. What remains unanswered is the amount of fishing effort required to reach a targeted exploitation rate (i.e., μ of 0.25) and if the minimum amount of effort needed to collapse the population is feasible.

Some previous sampling efforts for invasive carp have occurred in the Missouri River Basin. Since 2014, the U.S. Fish and Wildlife Service has conducted focused surveys of invasive carp in the Missouri River Basin and performed gear evaluations on novel active gears like the electrified paupier trawl (hereafter called paupier) and electrified dozer trawl (hereafter called dozer trawl; Hammen et al. 2019). In 2018, state and federal agencies conducted an invasive carp removal study at Creve Coeur Lake, a Missouri River floodplain lake near St. Louis, MO. Researchers in other portions of the Mississippi River Basin have evaluated passive gears such as pound nets (Collins et al. 2015) and drift nets (Roth 2018). These evaluations show varying effectiveness depending on the body of water and invasive carp life stage targeted. Still, most commercial fishermen and state agencies rely on standard commercial gears for sampling efforts.

The project outlined in this template will not only highlight management approaches to reduce invasive carp populations but also provide insight for removal efforts aimed at reducing invasive carp populations.

Project Objectives:

Long Term Goal Statement:

- Develop an approach to effectively reduce invasive carp populations in the Missouri River and its tributaries.

Short Term Goal Statement:

- Compare the effectiveness of a multi-gear removal approach across a gradient of tributary characteristics and invasive carp densities.

Research objectives:

- Compare the performance (CPUE per gear, total fish/tons removed) of multi-gear removals in MOR tributaries that differ with respect to watershed and invasive carp densities.
- Quantify change in density of silver carp.
- Quantify individual gear's contribution to removal.
- Estimate the amount of fishing effort required to achieve targeted exploitation rates among top-performing removal techniques with an open system.

Management objectives:

- Utilize a multi-gear removal to reduce carp by *no less than 25%* measured by an *immediate pre and post assessment.*
- Obtain 15,000 lbs. of Carp minimum for processor each week.

Methods:

Hydroacoustic surveys were conducted by the U.S. Fish and Wildlife Service (USFWS) on September 19, 2025, and September 26, 2025, to estimate Silver Carp densities before and after removal efforts on the Lamine River. Surveys included one upstream and one downstream transect extending from river kilometer 18 on the Lamine River to its confluence with the Missouri River. Hydroacoustic surveys were not conducted on the Platte River (MO) due to inadequate water depths and high amounts of woody debris and snags.

Standard boat electrofishing sampling was conducted pre- and post-removal in the Lamine and Platte River (MO) to evaluate removal efforts. Ten random five-minute runs were conducted at two sites with twenty total runs for each tributary. Lamine River Site 01 included rkm 0 to 9.9 and Site 02 rkm 10 to 18. Platte River Site 01 included rkm 0 to 4.8 and Site 02 rkm 4.9 to 10.7. Post-removal sampling included the same random sites sampled pre-removal.

Invasive carp were captured utilizing the paupier, dozer trawl, gill nets and boat electrofishing on the Lamine River. The paupier was not used on the Platte River (MO) primarily due to shallow water depths and high amounts of woody debris and snags. In the Lamine River, the paupier boat conducted 5 to 7 minute transects in the main channel focusing in areas with dense fish aggregations with daily pedal time and number of runs recorded. Electrified dozer trawls conducted transects in habitats outside of paupier area but later in the removal week worked in conjunction with electrofishing boats at times and daily pedal time and number of runs were recorded. Gill nets measuring 60.9, 91.4, 106.7 and 121.9 meters (200, 300, 350, 400 feet) in length and 3.7, 4.9 and 7.3m (12, 16, 24 ft) in depth hobbled down 0.6 m (2 ft) containing monofilament and multifilament nylon mesh sizes including 63.5, 76.2, 89, and 101.6mm (2.5, 3, 3.5, 4 inch) were deployed with multiple nets tied together and set in concentric circles in areas with dense aggregations of Silver Carp. Gill nets were also used as block nets with three nets set from bank to bank near the confluence areas and further upstream in small pools between shallow areas. Daily number of gill net sets and total length of nets were recorded. Boat electrofishing was utilized in areas difficult for other gears to sample (i.e., snags, brushpiles) and along the riverbanks. Electrofishing boxes were set to 60 pps and 40 Hz and enough volts to achieve 20 amps or more. Two to five electrofishing boats worked in unison to sample target areas and maximize catch.

All invasive carp captured were counted and identified to species, and all invasive carp (Silver, Bighead, Grass and Black Carp) were harvested, regardless of size. Invasive carp were transferred to 1.3 cubic meter bulk bags with 1000 kg weight capacity. Bulk bags containing invasive carp were then offloaded at the boat ramp using a backhoe to lift bags from boats and transferred to shipping containers provided by FKF Commercial Fishers at the Lamine and Missouri Coast Fisheries at the Platte River.

Gill nets, paupier and dozer trawl runs were subsampled on every fourth run for fish demographic and hydroacoustic apportionment data. All fish were identified to species, and lengths were collected for all individuals >250mm. These data were used to characterize bycatch, as well as assign identities to fish detected during hydroacoustic surveys.

Invasive carp catch per unit effort was calculated as fish per hour for paupier, dozer trawl and boat electrofishing. Gill net catch per unit effort was calculated as fish per 100 yards of net. Silver Carp pre- and post-removal catch rates, lengths and weights were tested for normality ($P<0.05$). If treatment groups passed the normality test, a one-way analysis of variance (ANOVA) was conducted and multiple pairwise comparisons were made using the Holm-Sidak method. When treatment groups failed normality test, analysis used a Kruskal-Wallis one way analysis of variance on ranks and when a significant difference in treatment groups was detected further analysis and multiple pairwise comparisons were made using Dunn’s method. Analysis was conducted using SigmaPlot 14.5 by SYSTAT.

Results and Discussion:

Platte River (MO) Removal

The Platte River invasive carp removal was conducted September 8th through the 11th and 22nd through 25th in 2025. Removal efforts totaled 15.3 hours with dozer trawl, 73.5 boat electrofishing hours and 69 gill net deployments (6,833 yards of net). Total catch amounted to 7,773 Silver Carp, 28 Bighead Carp, and 101 Grass Carp (Table 1) weighing 18,269 kilograms (40,277 lbs.) being removed from the Platte River.

The three gears; electrified dozer trawl, boat electrofishing and gill nets worked well together on the Platte River due to a narrower channel with shallow areas and dense woody debris. Catch rates on the first day were high (> 100 SVCP/hour) for both dozer trawl and boat electrofishing (Figure 2). The second week on the Platte resulted in higher catch rates for boat electrofishing on day 5 and gill net catch rates were higher on day 5 and 7 compared to the first week (Figure 2). This may be due to distribution of effort the first week with one electrofishing boat accompanying the gill nets. Also, gill net effort was greatly reduced the second week to free up boats and gear for the Lamine Carp Removal on the same week. However, multiple gill nets set bank to bank near the confluence of the Platte with the Missouri River (CPUE = 35.2 SVCP per 100 yards of net) had higher catch rates than circle sets (CPUE = 10.9 SVCP per 100 yards of net) and bank to bank sets (CPUE = 13.5 SVCP per 100 yards of net) further upstream.

Silver Carp was the most abundant species encountered by all sampling gears and the most abundant invasive carp species harvested. Silver Carp lengths ranged from 410 mm captured with dozer trawl to 868 mm captured in gill nets. Mean lengths ranged from 591 mm with dozer trawl to 622 mm with gill nets (Figure 3). Median length of Silver Carp captured in gill nets were significantly different ($P < 0.001$) than dozer trawl and boat electrofishing. This supports the inclusion of gill nets as a removal method in the right habitats to select for larger individuals. However, not all Silver Carp were measured, as subsampling techniques were used for all gears. Grass Carp lengths ranged from 550 mm collected with boat electrofishing to 952 mm captured with gill nets. Mean length of Grass Carp ranged from 690 mm with boat electrofishing to 743 mm captured in gill nets. Bighead Carp lengths ranged from 627 mm to 970 mm with a mean length of 741 mm captured in gill nets.

Standard boat electrofishing sampling pre- and post- removal indicated Silver Carp relative abundance in the Platte River (MO) significantly decreased ($P<0.001$) with an overall 58% decrease in abundance (Figure 4). Post-removal sampling also indicated a significant difference in length ($P<0.001$) and weight ($P<0.05$) of silver carp with more individuals sampled greater than 700mm in length and 4,000 grams in weight (Figure 5). This could be a factor of electrofishing gears efficiency at removing smaller size classes leaving only larger individuals that may be better at avoiding electrofishing gears.

Lamine River Removal

The Lamine River Invasive Carp Removal was conducted September 22nd through the 25th in 2025. Removal efforts totaled 5.72 hours for paupier runs, 13.4 hours with dozer trawl, 47.8 boat electrofishing hours and 15 gill net deployments (4,300 yards of net). Total catch amounted to 3,982 Silver Carp, 14 Bighead Carp, and 40 Grass Carp weighing 9,893 kilograms (21,810 lbs.) being removed from the lower Lamine River.

Silver Carp catch rates were variable throughout the week on the Lamine River. Day two effort was reduced for all gears due to weather. Catch rates were highest on day 3 for paupier and dozer trawl (Figure 6). This is probably due to their efforts focused further upstream on the Lamine and into the Blackwater River, a tributary to the Lamine. Boat electrofishing catch rates decreased daily.

Silver Carp was the most abundant species encountered by all sampling gears and the most abundant invasive carp species harvested. Silver Carp lengths ranged from 403 mm captured with paupier to 840 mm with boat electrofishing. Mean lengths ranged from 602 mm with boat electrofishing to 609 mm with gill nets (Figure 7). Median lengths of Silver Carp were not significantly different between gear types. However, not all Silver Carp were measured, as subsampling techniques were used for all gears. Grass Carp lengths ranged from 602 mm to 800 mm captured with gill nets. Mean length of Grass Carp ranged from 697 mm with boat electrofishing to 727 mm captured in gill nets. Bighead Carp lengths ranged from 679 mm captured in gill nets to 860 mm with dozer trawl and a mean length of 741 mm captured in gill nets (Figure 7).

Hydroacoustic assessments of the 2025 Lamine River removal effort showed a 37.1% reduction (1.16 SVCP per 1000m3 to 0.73 SVCP per 1000 m3) of the local Silver Carp population, surpassing the objective of a 25% decrease. By comparison, the 2024 Lamine River removal effort resulted in a 27.8% reduction when the post-removal survey was conducted one week after removal efforts were completed. Results from similar removal efforts on the Grand River indicated a 27.3% decrease in 2023 and 26.1% in 2024.

Post-removal silver carp abundance estimates with standard boat electrofishing on the Lamine River in 2025 indicated an 11% reduction in Silver Carp abundance. In contrast, removal efforts in 2024 on the Lamine River resulted in a significant decrease of 59% in silver carp abundance post removal, but it is important to note that pre abundance was 49% higher in 2024 than in 2025 as well.(Figure 8).

Although there is some discrepancey between depletion results from hydroacoustics and electrofishing, it is likely that the true effect of the removal on silver carp abundance in the Lamine River in 2025 still surpassed our objective of a 25% decrease. The total poundage removed was similar to previous years where we also surpassed this objective, and our pre-estimate of abundance was much lower than in previous years.

Recommendation:

For 2026 and beyond, removal techniques developed at the Grand, Lamine and Platte (MO) Rivers can be applied to new locations or repeated at each tributary. Logistically, an open-system removal was less resource-intense and is likely more applicable across a broader range of tributaries. Furthermore, we have evidence that the open-system removal effort removed a comparable percentage of invasive carp relative to the closed-system removal. This multi-gear carp removal approach could be utilized or modified in other tributaries throughout the Missouri River basin.

Hydroacoustic surveys, standard dozer trawl sampling and/or standard boat electrofishing pre- and post- removals should be conducted to evaluate efforts even if reductions are only temporary.

To continue forward progress, new goals and benchmarks for success should be established and planning should include the application of new fishing techniques. An evaluation of the applicability of commercial fishing crews should also occur to work towards a sustainable depletion model that can be applied across a larger geographical scale. New capture gears should be considered as well to further exploit the fish congregations noted on sonar imaging occurring beyond the reach of our gears. Specifically, deep habitats (>20 ft) provide refuge for invasive carp from many of our gears. Concurrently, the effectiveness of commercial fishing crews should be evaluated within the Missouri River basin to determine if they could be a cost-effective solution or addition to agency crews.

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Tables and Figures:

Figure 1. *Map of Missouri River and tributaries including Platte River (MO) at rkm 629 and Lamine River at rkm 325.*

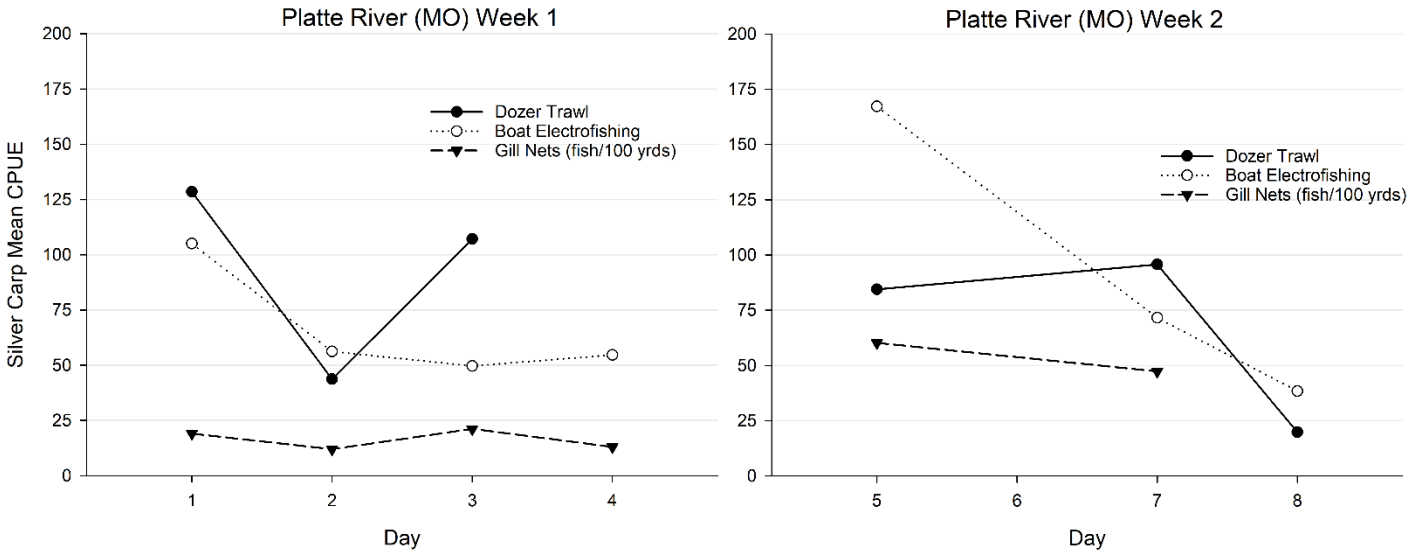

Figure 2. *Silver Carp catch per unit effort by gear and day for week 1 and 2 on the Platte River (MO). Note: No fishing occurred on day 6 week 2 due to weather.*

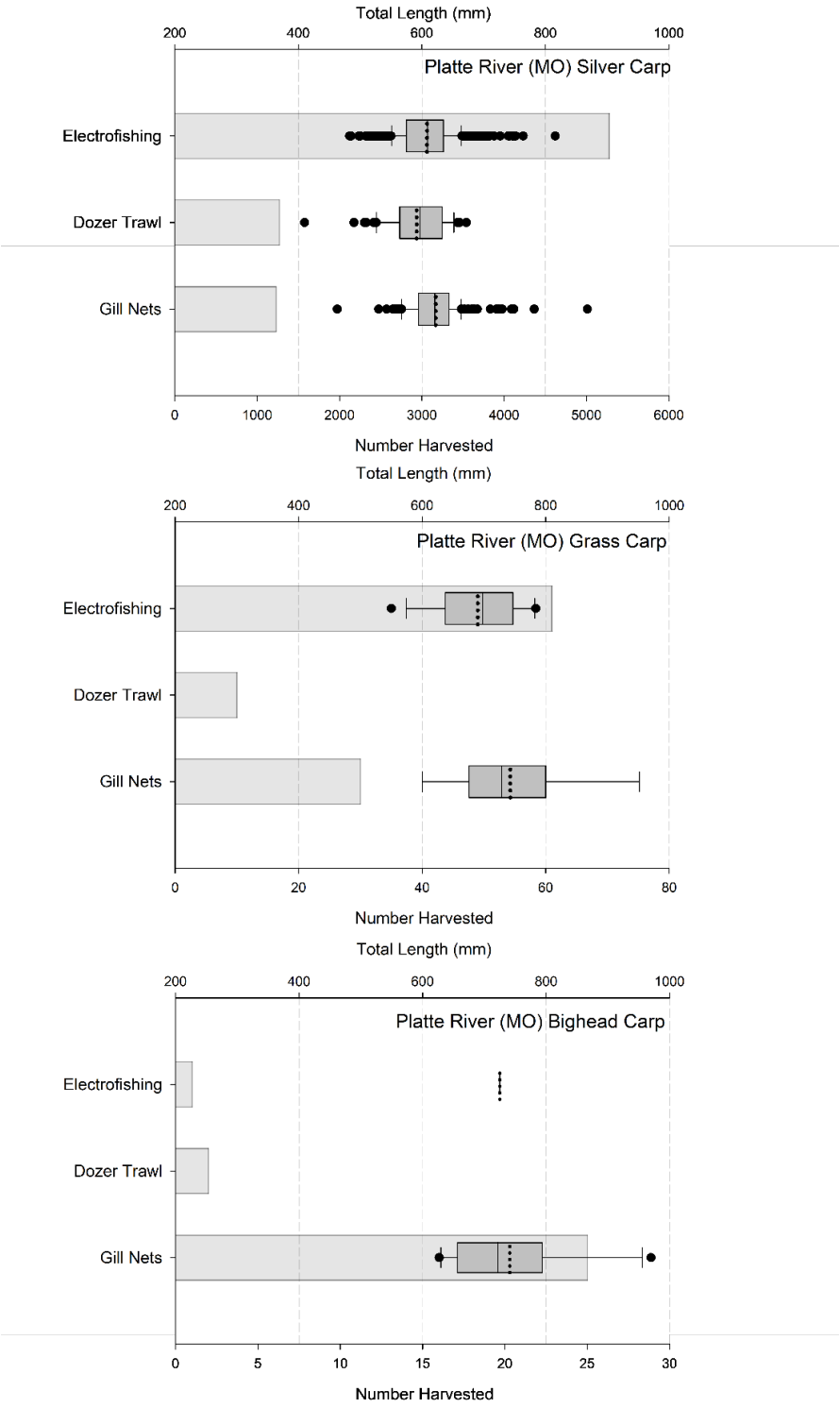

Figure 3. *Box plots of Silver(top), Grass(middle) and Bighead Carp(bottom) length (top X-axis) and bar graphs of number harvested (bottom X-axis) by gear (Electrofishing, Dozer Trawl and Gill Nets). Boxes represent the upper and lower quartiles, solid line represents the median, dotted line represents the mean, whiskers represent the 10th and 90th percentiles and black circles indicate outliers.*

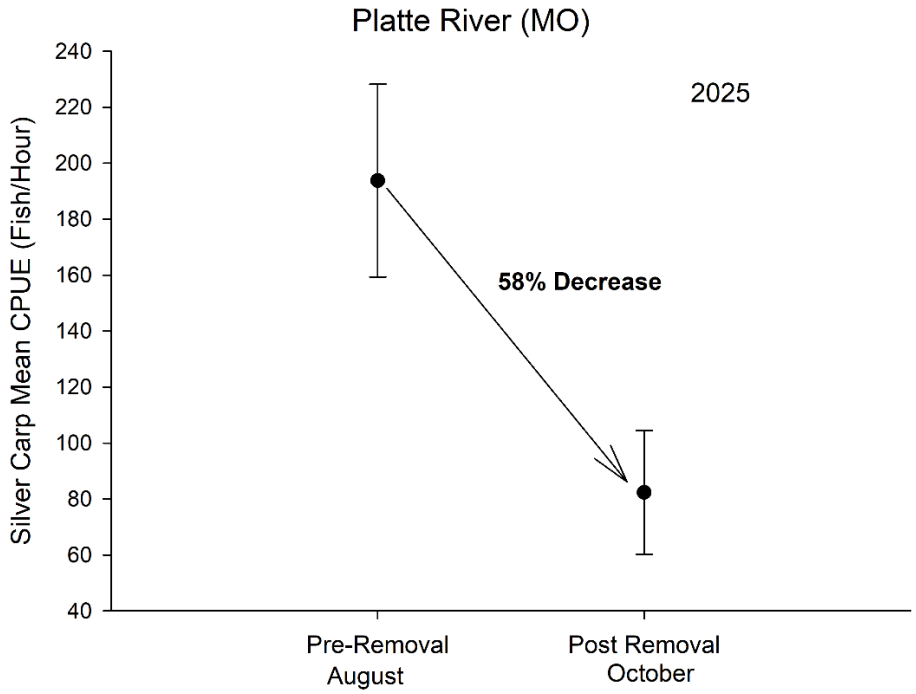

Figure 4. *Silver Carp catch per unit effort with standard boat electrofishing pre- and post-removal on the Platte River (MO) in 2025.*

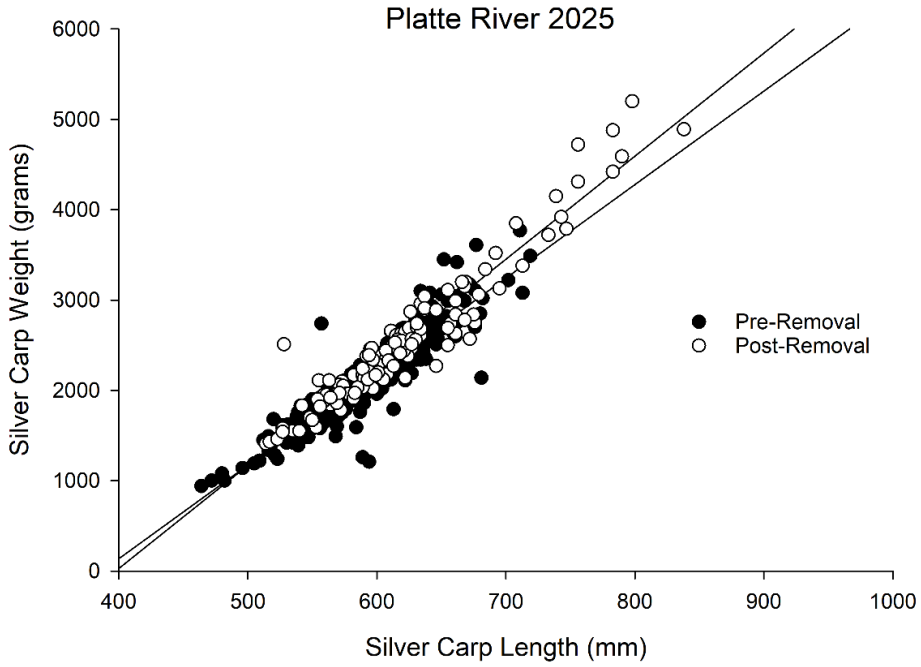

Figure 5. *Silver Carp length weight regressions pre- and post- removal.*

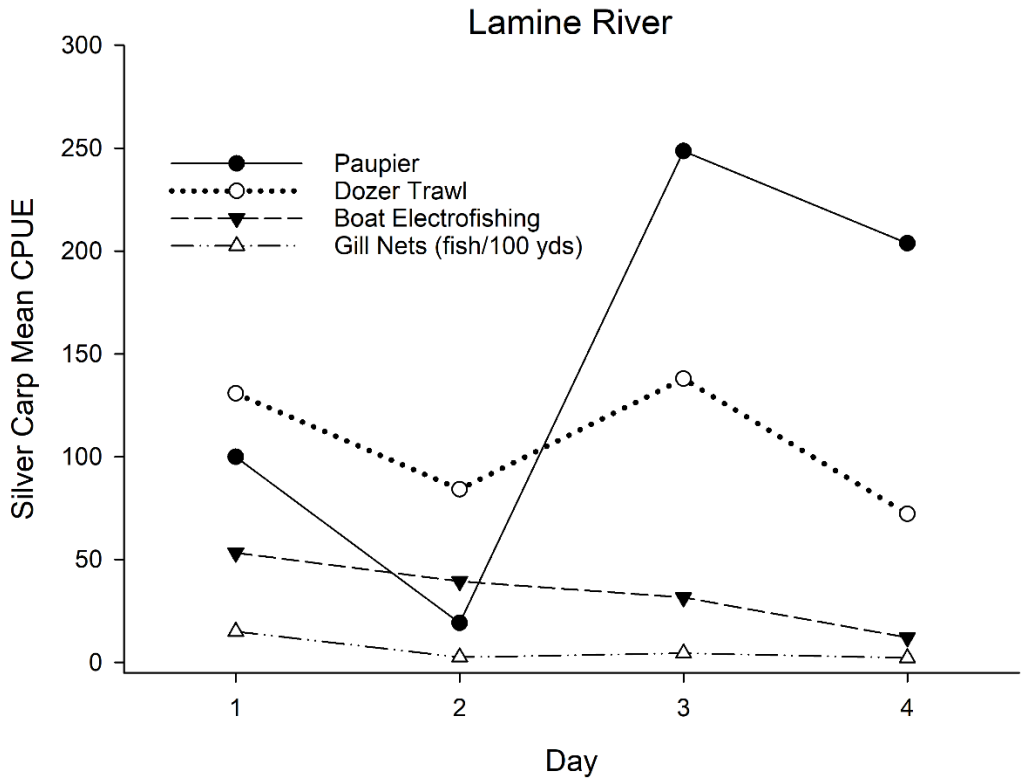

Figure 6. *Silver Carp catch per unit effort by gear and day on Lamine River 2025. Note: day two effort was reduced due to weather.*

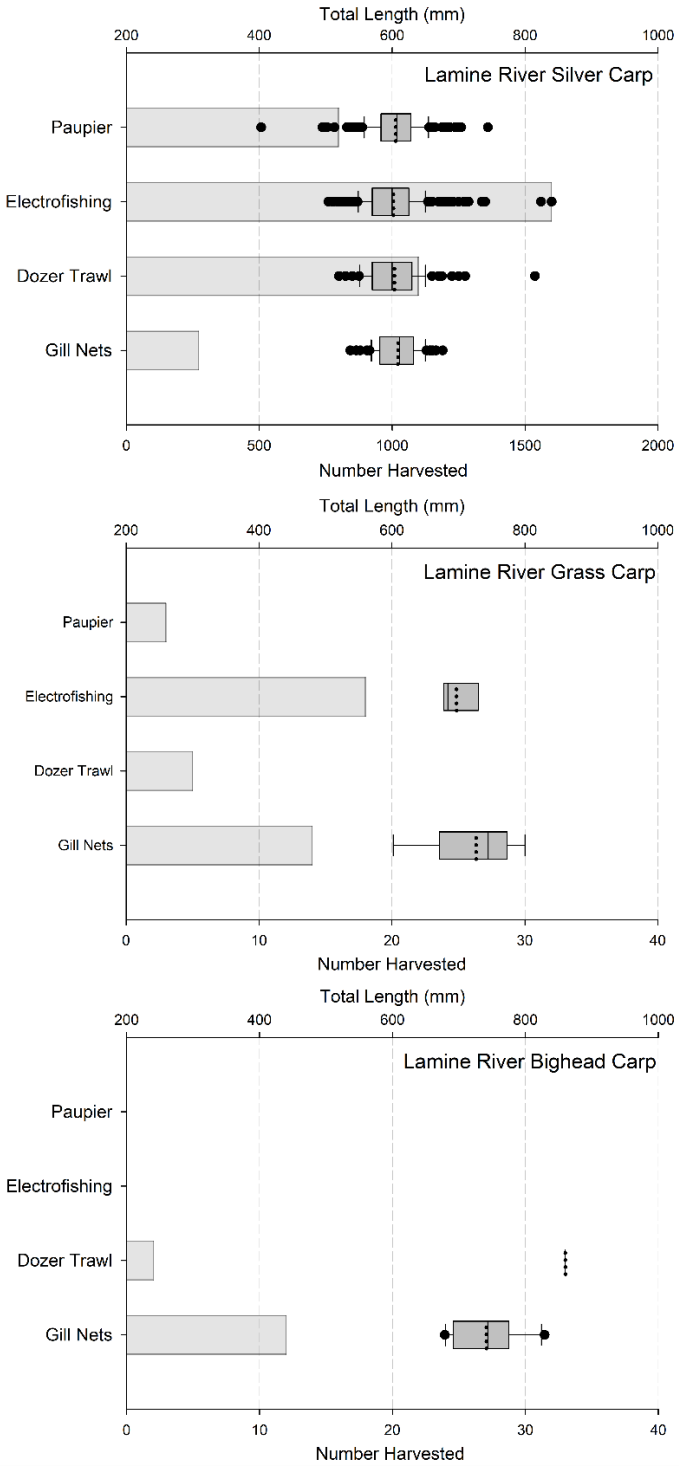

Figure 7. *Box plots of Silver(top), Grass(middle) and Bighead Carp(bottom) length (top X-axis) and bar graphs of number harvested (bottom X-axis) by gear (Paupier, Electrofishing, Dozer Trawl and Gill Nets). Boxes represent the upper and lower quartiles, solid line represents the median, dotted line represents the mean, whiskers represent the 10th and 90th percentiles and black circles indicate outliers.*

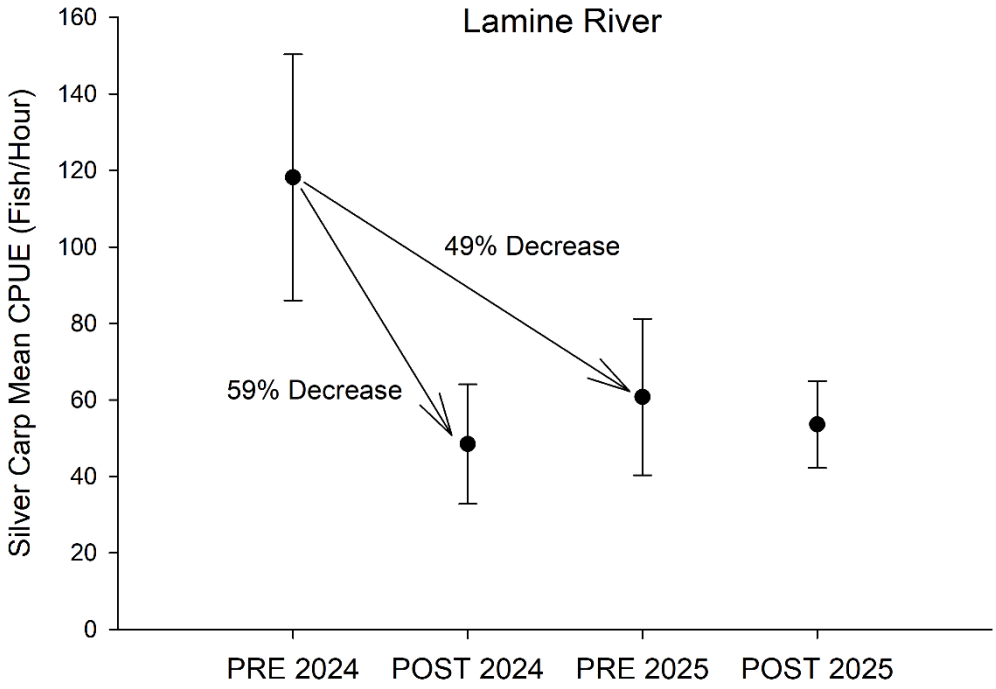

Figure 8. *Silver Carp catch per unit effort with standard boat electrofishing on the Lamine River pre- and post-removal in 2024 and 2025.*

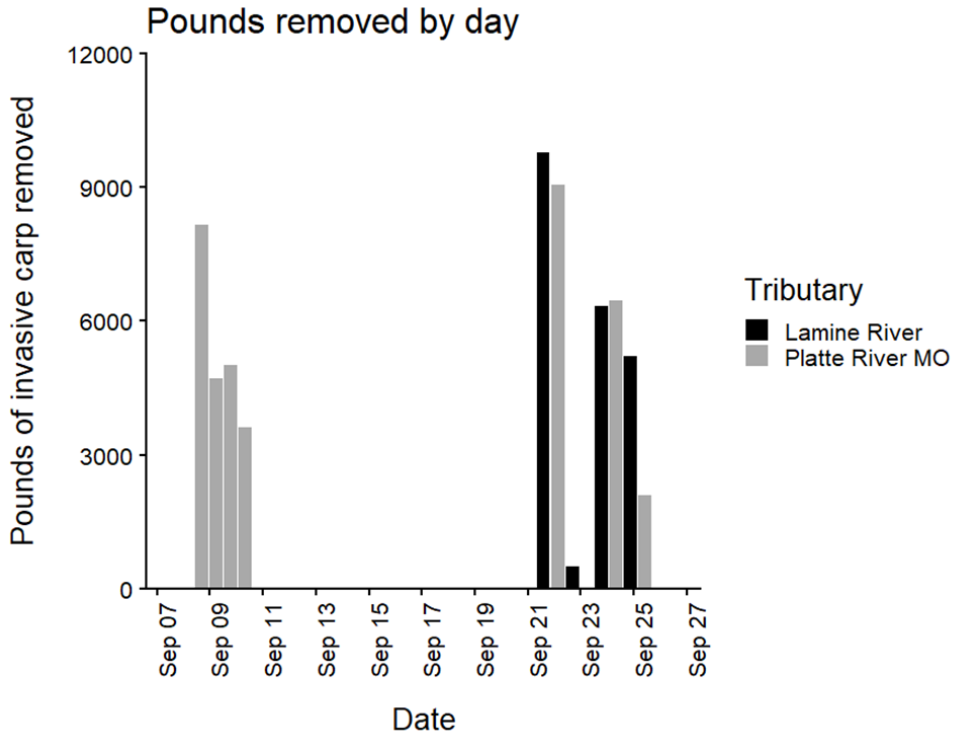

Figure 9. *Pounds removed per day per tributary.*

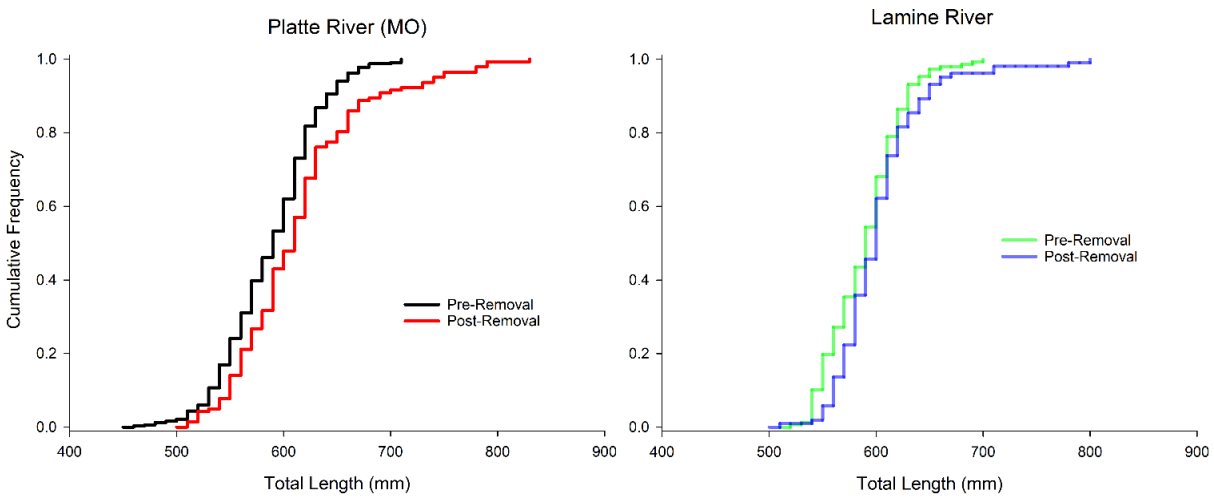

Figure 10. *Silver Carp cumulative length frequency distributions pre- and post-removal on the Platte River (MO) (left panel) and Lamine River (right panel).*

Table 1. *Summary of species, count and percent of total catch for all species from Platte and Lamine River carp removals. GN = Gill Net, DT = Dozer Trawl, EF = Boat Electrofishing, PA = Paupier.*

	Platte River					Lamine River					
Species	**GN**	**DT**	**EF**	**Total**	**% Total Catch**	**GN**	**DT**	**EF**	**PA**	**Total**	**%Total Catch**
Bighead Carp	**25**	**2**	**1**	**28**	**0%**	**12**	**2**			**14**	**0%**
Grass Carp	**30**	**10**	**61**	**101**	**1%**	**14**	**5**	**18**	**3**	**40**	**1%**
Silver Carp	**1,228**	**1,270**	**5,275**	**7,773**	**76%**	**271**	**1,098**	**1,761**	**852**	**3,982**	**81%**
Bigmouth Buffalo	32	6		38	0%	9	7		15	31	1%
Black Buffalo	5			5	0%	4	1			5	0%
Blue Catfish	20			20	0%	11				11	0%
Blue Sucker	5			5	0%	1				1	0%
Bluegill		1		1	0%						0%
Channel Catfish	1	2		3	0%	2	2			4	0%
Common Carp	37			37	0%	36	4		4	44	1%
Emerald Shiner		**1,250**		**1,250**	**12%**		17			17	0%
Flathead Catfish	2			2	0%	4				4	0%
Freshwater Drum	1	1		2	0%	3	10		1	14	0%
Gizzard Shad	**4**	**458**		**462**	**5%**	**1**	**161**		**50**	**212**	**4%**
Goldeye	1	14		15	0%	1	6		9	16	0%
Longnose Gar	24	18		42	0%	**10**	**93**		**25**	**128**	**3%**
Paddlefish	33	1		34	0%	**133**	**5**		**23**	**161**	**3%**
Red Shiner		6		6	0%		1			1	0%
River Carpsucker	64	4		68	1%	20	13		1	34	1%
Sauger				0	0%		1			1	0%
Shorthead Redhorse				0	0%		1			1	0%
Shortnose Gar	2	7		9	0%	2	50		17	69	1%
Silver Chub		52		52	1%						0%
Skipjack Herring		3		3	0%		1			1	0%
Smallmouth Buffalo	**276**	**10**		**286**	**3%**	**61**	**37**		**20**	**118**	**2%**
Spotted Bass				0	0%		1			1	0%
Spotted Gar	1			1	0%						0%
Total	1,791	3,115	5,337	10,243		595	1,516	1,779	1,020	4,910	

Appendix 3: Control and Containment of Invasive Carp in the Missouri River Basin

Lead Author, Agency, and Contact Information:

- Joe McMullen, Missouri Department of Conservation, joe.mcmullen@mdc.mo.gov
- Josh Abner, Missouri Department of Conservation, josh.abner@mdc.mo.gov

Participating Agencies: NA

Location of Activities:

- **MOR:** Missouri River within/adjacent to the State of Missouri:
    - Lower Missouri River: from its mouth (confluence with the Mississippi River; RM 0) near St. Charles, MO to the confluence of the Kansas River (RM 367) near Kansas City, MO.
    - Upper Missouri River: from the confluence of the Kansas River (RM 367) near Kansas City, MO to the Missouri-Iowa border (RM 553) near Minersville, NE.

Statement of Need:

Populations of invasive carp (Bighead Carp, Black Carp, Grass Carp, and Silver Carp) have rapidly expanded throughout the Mississippi River basin. Management and control of invasive carp is necessary to reduce their impact on native species, the ecosystem, and the economy. In response to these threats, many states throughout the Mississippi and Great Lakes basins are working to find effective strategies to manage existing populations and to control the expansion of invasive carp into adjacent aquatic systems. Appropriations for the Department of Interior indicate that '*while the Committees* (House Subcommittee on Interior, Environment, and Related Agencies and the Senate Subcommittee on Interior, Environment, and Related Agencies) *recognize the importance of studying and understanding invasive carp patterns, the Service* (U.S. Fish and Wildlife Service) *is encouraged to take action on a strategy that increases the focus on biomass removal and restricts carp progression by coordinating with other Federal partners on constructing invasive carp barriers'*. This project addresses the need for biomass removal.

Project Objectives:

- **MOR:**
    1) Continue incentivized commercial removal of invasive carp to reduce carp densities and propagule pressure throughout the basin.
    2) Monitor fish assemblages in the Missouri River.

Project Highlights:

- The Missouri Incentivized Carp Harvest Program (MO-ICHP) subsidized the commercial harvest of 4,602,641 lbs. of invasive carp during 2025.
    - **LMR:** 349,949 lbs.
    - **UMR:** 4,252,692 lbs.
    - **MOR:** 0 lbs.
- Due to a funding lapse, incentive payments for an additional 823,223 lbs. of invasive carp harvested from designated waters of the MO-ICHP were funded by the Ohio Rive Basin Enhanced Contract Fishing Program (ORB-ECFP).
- Fish assemblage sampling occurred by boat electrofishing during 2025.
    - **MOR:** Sampling occurred at 16 randomly selected sites; 984 fish (36 species) were collected.

Methods:

In July 2023, MDC contracted with Tetra Tech, Inc. to implement and manage an invasive carp harvest program. In October 2023, the MO-ICHP launched to promote the commercial harvest of invasive carp from UMR Pools 20, 21, and 22 and the LMR. In December 2023, the program expanded to include UMR Pools 24 and 25. In July 2024, the program expanded to include UMR Pool 26, Open River North, and Open River South. In December 2024, the program expanded to include the Missouri River. The MO-ICHP offers 10¢/lb. for invasive carp caught in designated waters (Figure 1) and sold for at least 7¢/lb. Individuals with a valid commercial fishing permit in Missouri, Illinois, Kentucky, Tennessee, Kansas, or Nebraska may enroll in the program and must abide by all applicable commercial fishing regulations. Tetra Tech, Inc. manages contracts with and incentive payments to participating fishers.

MO-ICHP funds were exhausted during 2025, causing a funding lapse during May-July 2025. The Illinois Department of Natural Resources supported the MO-ICHP during the funding lapse and funded incentive payments for carp harvested on designated waters of the MO-ICHP through the ORB-ECFP.

MDC staff have conducted fish assemblage sampling since 2022 on the lower Mississippi River and beginning in 2025 on the lower Missouri River to collect baseline data and identify potential effects that invasive carp removals may have on native fish. Sites are randomly selected each year and sampling is standardized with Upper Mississippi River Restoration's (UMRR) Long Term Resource Monitoring (LTRM) sampling efforts (Ratcliff et al. 2014). Sampling sites on the Missouri River during 2025 were limited to a relatively small section of river (river miles 10-20) due to accessibility issues associated with low water levels. Sampling sites on the lower Mississippi River during 2025 were spread across a larger section of river (river miles 880-920) to better mimic UMRR LTRM sampling protocols. All fish captured were identified to species, measured, and a subset were weighed. Water quality and habitat data were collected and

recorded at each site and included Secchi disk measurement, dissolved oxygen, water conductivity, water temperature, water depth, and substrate type.

Results and Discussion:

During 2025, 39 commercial fishers participated in the MO-ICHP. Participants reported the harvest of 4,602,641 lbs. of invasive carp. Silver Carp comprised ≈97% of the total harvest (4,469,067 lbs.), while Grass Carp (≈3%; 123,712 lbs.) and Bighead Carp (<1%; 9,862 lbs.) harvests were relatively minor (Table 1). No harvest of Black Carp was reported. Harvest peaks occurred during cool weather months (March/April and November-December) while harvest during warm weather periods (May-July) was relatively low (Figure 2). However, relatively low harvest occurred during January/February perhaps due to extreme cold and/or ice flows.

During the MO-ICHP funding lapse (May-July 2025) an additional 823,223 lbs. of invasive carp were harvested from designated waters and incentive payments were funded by the ORB-ECFP. Harvest totals during the funding lapse are documented in Table 1, Table 2, and Figure 2 below corresponding, MO-ICHP funded totals. Although the lapse did not begin until May, some April harvest was funded by the ORB because some April receipts were not received and processed until May. The combined harvest from both funding sources was 5,425,864 pounds.

UMR harvest accounted for ≈92% (4,252,692 lbs.) of the total harvest and was highest from Pool 26 (941,398 lbs.), followed by Pool 24, (803,258 lbs.), Pool 25, (722,604 lbs.), Pool 20 (632,972 lbs.), Pool 22 (533,360 lbs.), Pool 21 (343,819 lbs.), Open River North (208,727 lbs.), and Open River South (66,554 lbs.) (Table 2). LMR harvest accounted for ≈8% (349,949 lbs.) of the total harvest. No harvest was reported from the Missouri River.

Gill nets were used to harvest ≈96% (4,429,493 lbs.) the total invasive carp harvest during 2025. Other equipment/gears used to harvest invasive carp included seins (≈4%; 159,320 lbs.), and hoop nets (<1%; 13,828 lbs.).

Average price paid for invasive carp by fish processors/wholesale buyers during 2025 were ≈20¢/lb. for bighead carp (range 12-35¢/lb.), ≈13¢/lb for silver carp (range 12-20¢/lb.), and ≈27¢/lb. for grass carp (range 10-40¢/lb.).

Bycatch (i.e., harvest of species other than invasive carp) is tracked. However, bycatch reported herein is only a measure of species retained and sold along with invasive carp that are submitted for an incentive payment. Fish that are released or harvested but not sold along with incentivized carp hauls are not accounted for. Bycatch reported during 2025 included buffalofish (68,548 lbs.), Common Carp (6,994 lbs.), catfish (7,554 lbs.), Freshwater Drum (986 lbs.) and 2,513 lbs. of unidentified fish.

During fish assemblage sampling on the lower Mississippi River, MDC staff collected a total of 3,121 fish (43 species) (Table 3) from 31 sites (Figure 3). Twelve Silver Carp were collected along with one Grass Carp, but no Bighead Carp or Black Carp were collected. Missouri Species of Conservation Concern (SOCC) encountered included Skipjack Herring and Spotfin Shiner.

During fish assemblage sampling on the Missouri River, MDC staff collected a total of 984 fish (36 species) (Table 4) from 16 sites (Figure 4). Two Silver Carp were captured along with two Grass Carp, but no Bighead Carp or Black Carp were collected. Missouri Species of Conservation Concern (SOCC) encountered included American Eel and Fathead Minnow.

Recommendation:

- Continue to promote and fund the Missouri Incentivized Carp Harvest Program.
- Identify and pursue high impact opportunities to implement invasive carp removals on off-channel waterbodies (e.g., Creve Coeur Lake) and areas not classified as 'Commercial Waters' (e.g., Alton Slough).
- Encourage a basin-wide approach to structuring invasive carp removal programs among jurisdictions to minimize competition between programs.

References:

Ratcliff, E. N., E. J. Gittinger, T. M. O'Hara, and B. S. Ickes. 2014. Long Term Resource Monitoring Program Procedures: Fish Monitoring, 2nd edition. A Program Report submitted to the U.S. Army Corps of Engineers' Upper Mississippi River Restoration-Environmental Management Program. June 2014. Program Report LTRMP 2014-P001. 88 pp. including Appendixes A–G.

Tables and Figures:

Table 1. *Pounds of invasive carp harvested during 2025 by month and species.*

Missouri Incentivized Carp Harvest Program (MO-ICHP)				
Month	**Total**	**Invasive Carp Species**		
		Bighead	**Silver**	**Grass**
Jan-25	**116,382**	0	94,795	21,587
Feb-25	**307,308**	2,575	282,761	21,972
Mar-25	**587,577**	17	585,048	2,512
Apr-25	**551,445**	3,952	541,884	5,609
***ORB-ECFP**	***46,196**	*559	*45,060	*577
May-25	**161,430**	0	153,544	7,886
***ORB-ECFP**	***188,921**	*0	*185,679	*3,242
Jun-25	**0**	0	0	0
***ORB-ECFP**	***390,589**	*1,829	*382,914	*5,846
Jul-25	**110,229**	20	104,990	5,219
***ORB-ECFP**	***197,517**	*0	*192,555	*4,962
Aug-25	**497,595**	753	486,212	10,630
Sep-25	**399,832**	459	383,392	15,981
Oct-25	**408,797**	149	399,290	9,358
Nov-25	**795,867**	0	783,177	12,690
Dec-25	**666,180**	1,937	653,974	10,269
***2025 Total**	**4,602,641**	**9,862**	**4,469,067**	**123,712**
***ORB-ECFP**	***823,223**	***2,388**	***806,208**	***14,627**
****Grand Total**	****5,425,864**	****12,250**	****5,275,275**	****138,339**

** Additional pounds of invasive carp harvested and funded through the Ohio River Basin Enhanced Contract Fishing Program (ORB-ECFP) during the MO-ICHP funding lapse.*
*** Grand total equals all harvest, in pounds, from both MO-ICHP and ORB-ECFP funding combined.*

Table 2. *Pounds of invasive carp (all species combined) harvested during 2025 by month and sub-basin/management unit.*

Missouri Incentivized Carp Harvest Program (MO-ICHP)												
Month	**Total**	**Sub-Basin / Management Unit**										
		Lower Mississippi River (LMR)	**Upper Mississippi River (UMR)**								**Missouri River (MOR)**	
			Open River South	**Open River North**	**Pool 26**	**Pool 25**	**Pool 24**	**Pool 22**	**Pool 21**	**Pool 20**	**Lower MO River**	**Upper MO River**
Jan-25	**116,382**	29,058	3,048	27,474	0	0	29,525	27,277	0	0	0	0
Feb-25	**307,308**	15,943	1,225	121,956	26,064	35,912	25,218	36,469	20,255	24,266	0	0
Mar-25	**587,577**	1,902	4,756	27,660	196,422	113,193	132,323	44,522	44,636	22,163	0	0
Apr-25	**551,445**	10,708	0	0	123,538	150,362	141,336	37,326	28,138	60,037	0	0
***ORB-ECFP**	***46,196**	*0	*0	*0	*13,576	*22,589	*0	*4,527	*0	*5,504	*0	*0
May-25	**161,430**	24,985	0	0	0	15,103	38,168	8,664	71,107	3,403	0	0
***ORB-ECFP**	***188,921**	*13,935	*0	*0	*27,780	*69,338	*31,427	*12,083	*24,799	*9,559	*0	*0
Jun-25	**0**	0	0	0	0	0	0	0	0	0	0	0
***ORB-ECFP**	***390,589**	*18,569	*0	*0	*30,457	*89,024	*90,239	*57,047	*80,224	*25,029	*0	*0
Jul-25	**110,229**	4,378	0	0	5,683	5,187	27,112	37,284	9,148	21,437	0	0
***ORB-ECFP**	***197,517**	*3,856	*0	*0	*21,378	*58,707	*38,343	*27,499	*28,840	*18,894	*0	*0
Aug-25	**497,595**	22,942	0	0	87,682	157,882	83,441	51,483	33,992	60,173	0	0
Sep-25	**399,832**	42,528	0	0	35,894	150,861	53,263	16,805	9,366	91,115	0	0
Oct-25	**408,797**	85,356	0	0	108,843	39,014	34,284	25,535	11,772	103,993	0	0
Nov-25	**795,867**	30,838	0	0	179,697	31,393	128,896	159,072	90,682	175,289	0	0
Dec-25	**666,180**	81,311	57,525	31,637	177,575	23,697	109,692	88,923	24,723	71,096	0	0
2025 Total	**4,602,641**	**349,949**	**66,554**	**208,727**	**941,398**	**722,604**	**803,258**	**533,360**	**343,819**	**632,972**	**0**	**0**
***ORB-ECFP**	***823,223**	*36,360	*0	*0	*93,191	*239,658	*160,009	*101,156	*133,863	*58,986	*0	*0
****Grand Total**	****5,425,864**	****386,309**	****66,554**	****208,727**	****1,034,589**	****962,262**	****963,267**	****634,516**	****477,682**	****691,958**	****0**	****0**

** Additional pounds of invasive carp harvested and funded through the Ohio River Basin Enhanced Contract Fishing Program (ORB-ECFP) during the MO-ICHP funding lapse.*

*** Grand total equals all harvest, in pounds, from both MO-ICHP and ORB-ECFP funding combined.*

Table 3. *Number of fish caught, by species, during fish assemblage sampling on the lower Mississippi River during fall 2025*

Species	No.	Species	No.
Bigmouth Buffalo	3	Longear Sunfish	21
Black Buffalo	14	Longnose Gar	31
Black Crappie	1	Orangespotted Sunfish	5
Blacktail Shiner	19	Red Shiner	29
Blue Catfish	3	Redear Sunfish x Green Sunfish	1
Blue Sucker	2	River Carpsucker	12
Bluegill	15	River Shiner	357
Bluntnose Minnow	1	Shortnose Gar	68
Brook Silverside	1	Silver Carp	12
Bullhead Minnow	8	Silver Chub	2
Channel Catfish	21	Skipjack Herring	14
Channel Shiner	113	Smallmouth Bass	4
Common Carp	42	Smallmouth Buffalo	21
Emerald Shiner	1,299	Spotfin Shiner	1
Flathead Catfish	31	Spotted Bass	20
Freshwater Drum	95	Stonecat	1
Gizzard Shad	600	Threadfin Shad	209
Goldeye	3	Western Mosquitofish	1
Grass Carp	1	White Bass	16
Green Sunfish	14	White Bass x Striped Bass	1
Inland Silverside	1		
Largemouth Bass	1		
Logperch	7	**Total**	**3,121**

Table 4. *Number of fish caught, by species, during fish assemblage sampling on the lower Missouri River during fall 2025.*

Species	No.	Species	No.
American Eel	1	Longear Sunfish	1
Blue Catfish	4	Longnose Gar	14
Blue Sucker	4	Orangespotted Sunfish	1
Bluegill	4	Red Shiner	270
Bluntnose Minnow	1	River Carpsucker	3
Bullhead Minnow	34	River Shiner	1
Channel Catfish	15	Shortnose Gar	18
Channel Shiner	9	Silver Carp	2
Chestnut Lamprey	1	Smallmouth Bass	1
Common Carp	32	Smallmouth Buffalo	7
Emerald Shiner	344	Speckled Chub	2
Fathead Minnow	1	Spotted Bass	1
Flathead Catfish	101	Spotted Gar	1
Freshwater Drum	36	Western Mosquitofish	1
Gizzard Shad	60	White Bass	2
Goldeye	4	White Bass x Striped Bass	1
Grass Carp	2	White Crappie	1
Green Sunfish	2		
Green Sunfish x Bluegill	2	**Total**	**984**

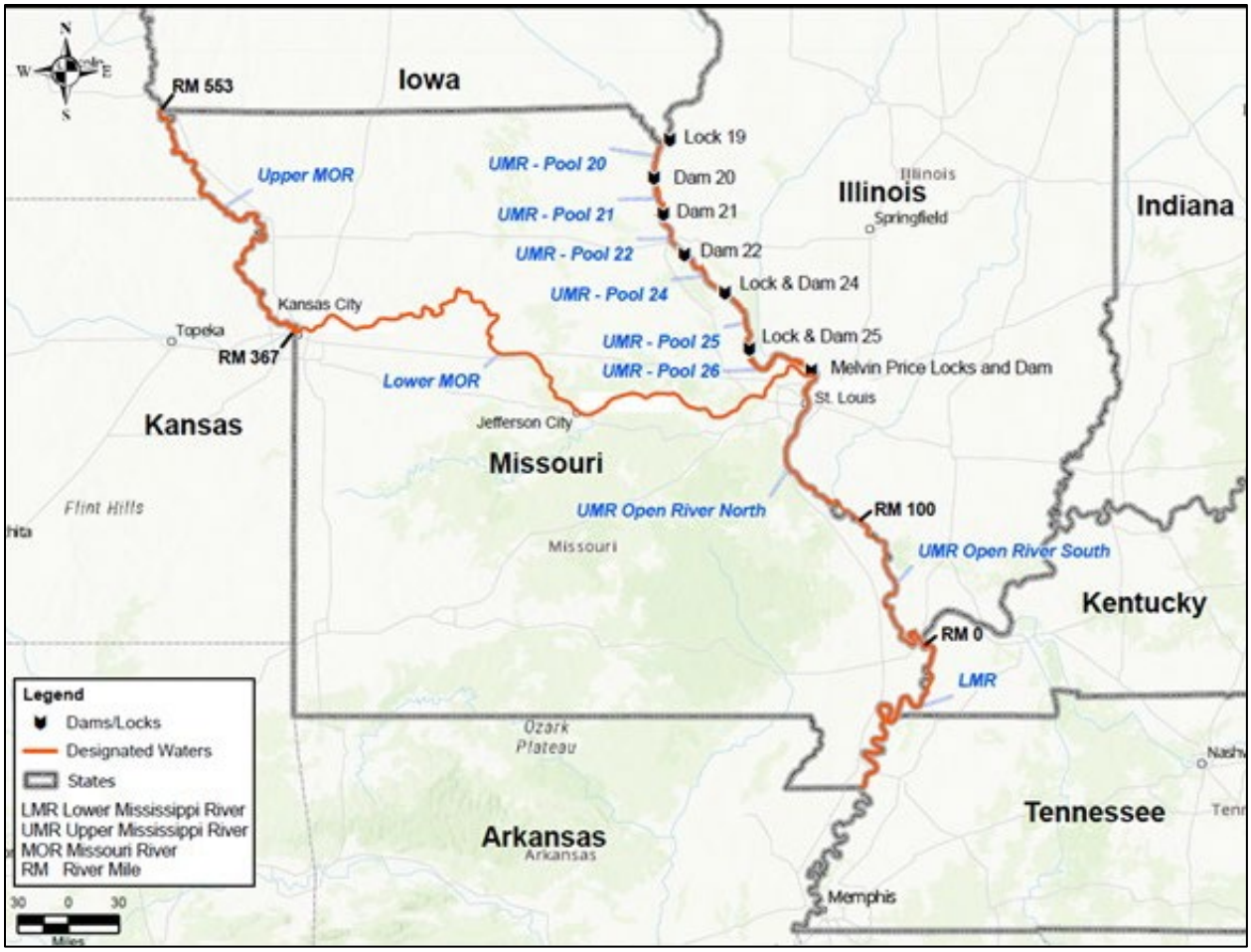

Figure 2. *Missouri Incentivized Carp Harvest Program (MO-ICHP) designated waters and management units.*

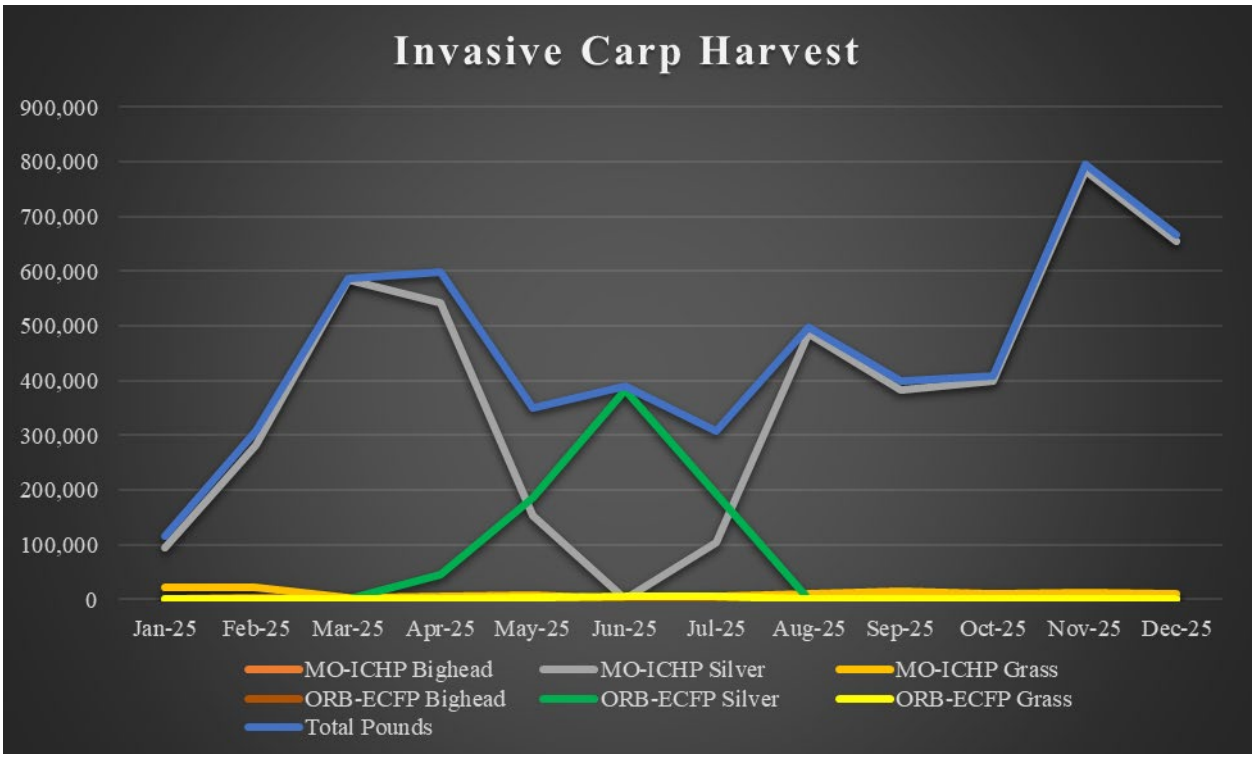

Figure 3. *Pounds of invasive carp harvested during 2025 by month. Species totals are separated by funding source (Missouri Incentivized Carp Harvest Program (MO-ICHP) and Ohio River Basin Enhance Contract Fishing Program (OHB-ECFP)). Total pounds includes all species combined from both funding sources combined.*

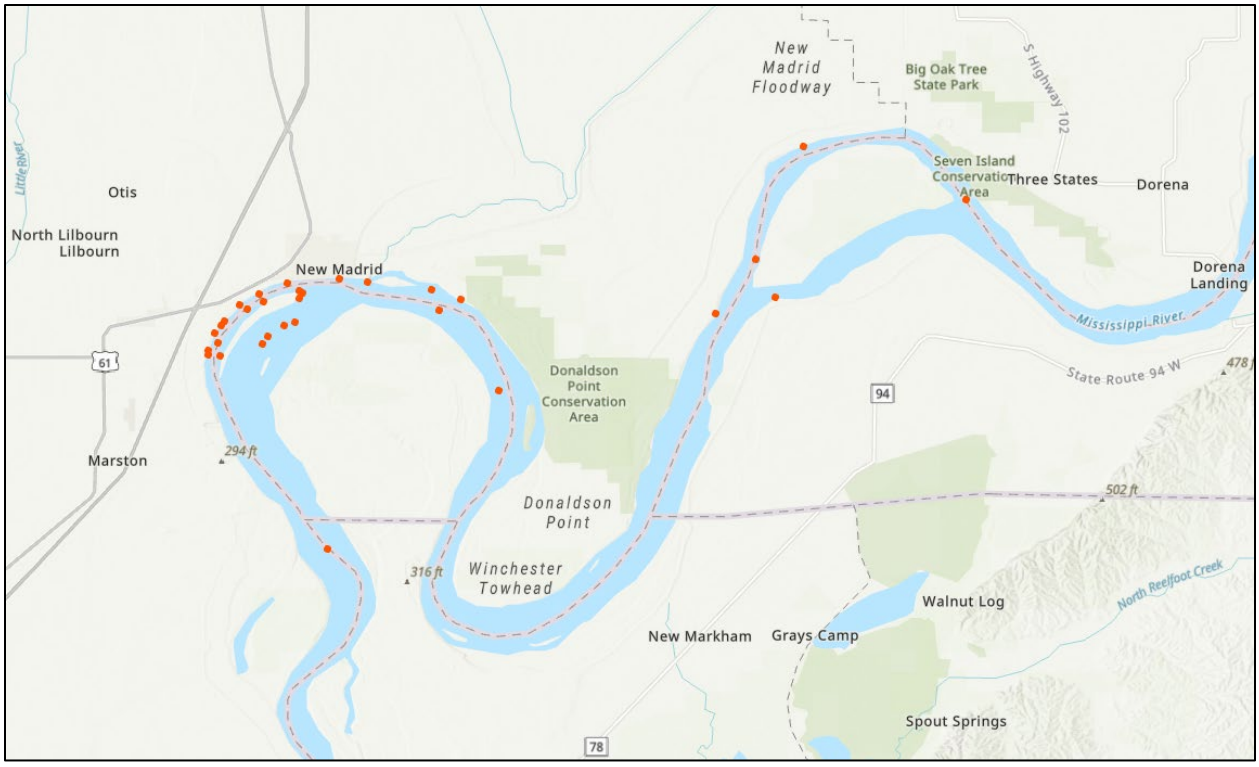

Figure 4. *Locations of fish assemblage sampling sites on the lower Mississippi River during 2025.*

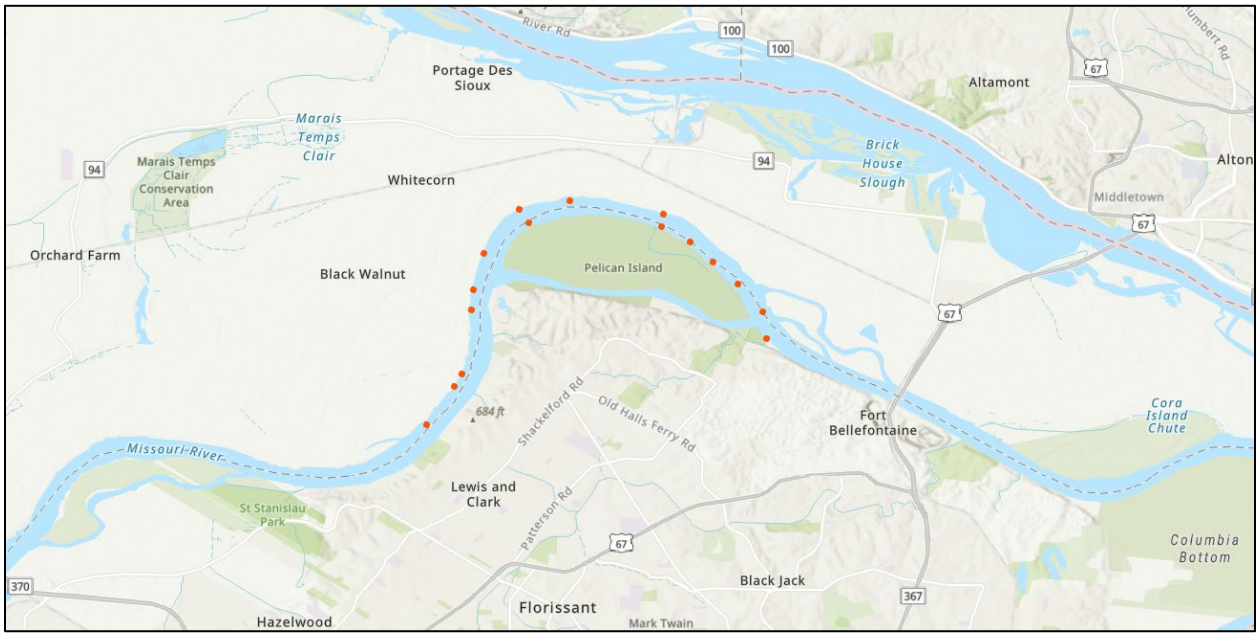

Figure 5. *Locations of fish assemblage sampling sites on the lower Missouri River during 2025.*