Project Title: : Seasonal Movement and Habitat Use of Invasive Carp in the Neosho River-Grand Lake System to Inform Removal

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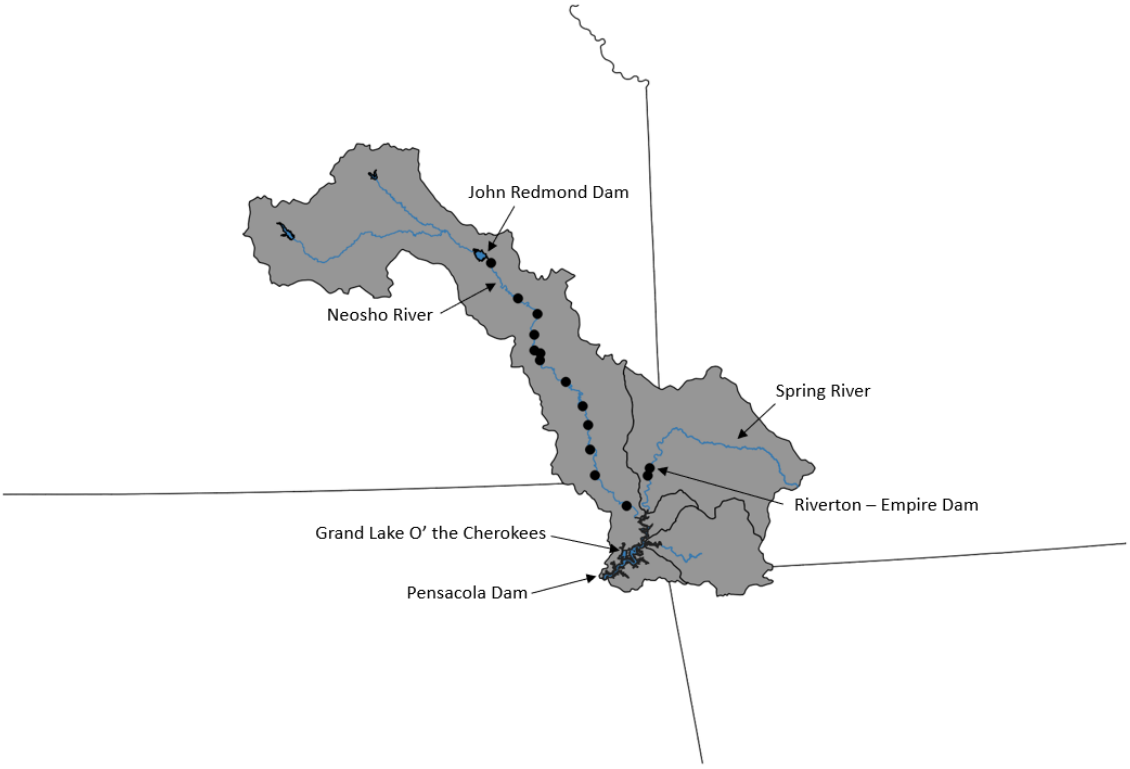
Participating Agencies: Missouri State University (MSU), Oklahoma Department of Wildlife Conservation (ODWC)

Location of Activities: Neosho River – Grand Lake System



Statement of Need: In North America, invasive carp (i.e., Bighead Carp Hypophthalmichthys nobilis, Silver Carp H. moltrix, Grass Carp Ctenopharygodon idella, Black Carp Mylopharygodon piceus) have successfully invaded many inland aquatic systems. Invasive carp exhibit the characteristics of a successful invader (e.g., rapid growth, efficient dispersal capabilities, high-reproductive potential, lack of natural predators, and wide environmental tolerance). Studies have demonstrated negative effects on native and game fish abundance and condition, particularly native planktivores (e.g., Paddlefish Polyodon spathula, Gizzard Shad Dorosoma cepedianum, and Bigmouth Buffalo Ictiobus cyprinellus). Invasive carp impacts need to be evaluated. Additionally, native fishes during all life stages (i.e., larvae, juvenile, adult) are likely deleteriously influenced by increasing numbers of invasive carp. As such, there is a need to evaluate seasonal movement and habitat use of invasive carp telemetry study to inform removal and develop control/eradication methods.

Understanding fish movement and habitat use is a critical component of large-river ecology, especially the overlap between nonindigenous fishes and native fauna (Yallaly et al. 2014; Phelps et al. 2015; Phelps et al. 2017). Non-native invasive carp can pose deleterious effects in large river ecosystems. Despite the apparent relevance, invasive carp impacts on native biota have received little attention. This is especially true for systems where invasive carp have recently invaded (Kolar et al. 2005; Chapman et al. 2016). Invasive carp have been extensively introduced beyond their range and were brought to the United States for biological control in the 1970's (Jennings 1988). After escaping ponds, the invasive carp spread throughout the Mississippi River, Missouri River, and Ohio River basins and now inhabit a majority of the United States' open waters (Kolar et al. 2005). Since that time, invasive carp biomass has increased substantially and are likely posing negative effects on aquatic systems. Specifically, Invasive carp may compete with and or consume native biota (fishes, mollusks, invertebrates, etc.) or disrupt trophic interactions through direct reductions in primary and secondary productivity (i.e., phytoplankton and zooplankton; Sampson et al. 2009; Phelps et al 2017).

Specifically, Schrank et al. (2003) suggested bigheaded carps (i.e., silver and bighead carp) had deleterious effects on Paddlefish under experimental conditions. Furthermore, D. Chapman (Personal Communication) suggested Invasive carp are posing deleterious effects on native fishes in the Missouri River. Irons et al. (2007) and Phelps et al. (2017) used data from the Long-Term Resource Monitoring (LTRM) element in the Illinois River and suggested negative interactions between native fishes (i.e., Gizzard Shad and Bigmouth Buffalo) and Invasive Carp. Correspondingly and relative to the upper Mississippi River, Phelps et al. (2017) also suggested negative interactions between native and non-native planktivores. Specifically, Phelps et al. (2017) documented that the relative abundance and condition of many of the native fishes in the Mississippi River basin are declining as bigheaded carp relative abundance has increased.

Currently, invasive carp are well documented and studied in areas of hyperabundance (e.g., Solomon et al. 2015; Phelps et al. 2017), however, knowledge gaps remain (Chapman et al. 2016). Specifically, minimal Invasive carp information exists in the Neosho River Grand Lake System, despite invasive carp presence as far upstream as John Redmond Reservoir and below Baxter Springs Dam on the Spring River (Rasset unpublished data). This is especially troubling given Invasive carp adults have the propensity to move long distances in relatively short time intervals (Tripp and Phelps 2018, N. Jackson, Personal Communication). However, uncertainty exists as to the spatial extent or intensity of invasive carp in the upper portion of the Neosho River Grand Lake System (i.e., adult abundance [presence], reproduction, movement/passage) and the relative influence on native fishes. Biological information is needed for proper invasive species management and control (Simberloff 2003). Acquiring this information is particularly important given the collaborative efforts (among state and federal agencies) that are currently occurring throughout various river basins to evaluate the Invasive carp population. Given that minimal information exists in the Neosho River Grand Lake System, a telemetry study is needed and will be complementary to many various state and federal agencies evaluating movement patterns of invasive carp.

Project Objectives:

1) Determine seasonal movement and habitat use of invasive carp in the Neosho River-Grand Lake System to inform removal.

Project Highlights:

- Nine invasive carp have been successfully captured and tagged in the Neosho River - Grand Lake system: 5 bighead carp and 4 grass carp.
- Telemetry receivers are in the process of being deployed with 8 currently in place and an additional 37 planned.

Methods: Five bighead carp and four grass carp were successfully tagged and released in 2024. Bighead carp were captured using live scope targeting methods and grass carp via standard electrofishing. All invasive carp were implanted with ultrasonic transmitters (Vemco V16-5H; 69kHz) using methods described in Tripp et al. (2014). The largest bighead carp measured 55" and weighed 103lbs. Tagged grass carp ranged from 30" – 36" with all captures occurring within Tar Creek (Miami, OK). All bighead carp were collected in the Elk River arm of Grand Lake during July and August. In 2024, eight receivers were deployed in strategic locations with 37 additional receivers planned to be deployed in 2025. Installed receivers and planned locations for 2025 receiver deployments are shown in [Figure 1].

Results and Discussion: Stationary receiver arrays within the Elk River arm have successfully detected the tagged bighead carp. Active tracking efforts have detected tagged grass carp around the mouth and within Tar Creek,but have not detected any bighead carp. These preliminary results suggest minimal movement during summer months. Additional data collection, including active tracking, and analyses are currently underway to better understand the overall population structure and movement patterns.

Tables and Figures:

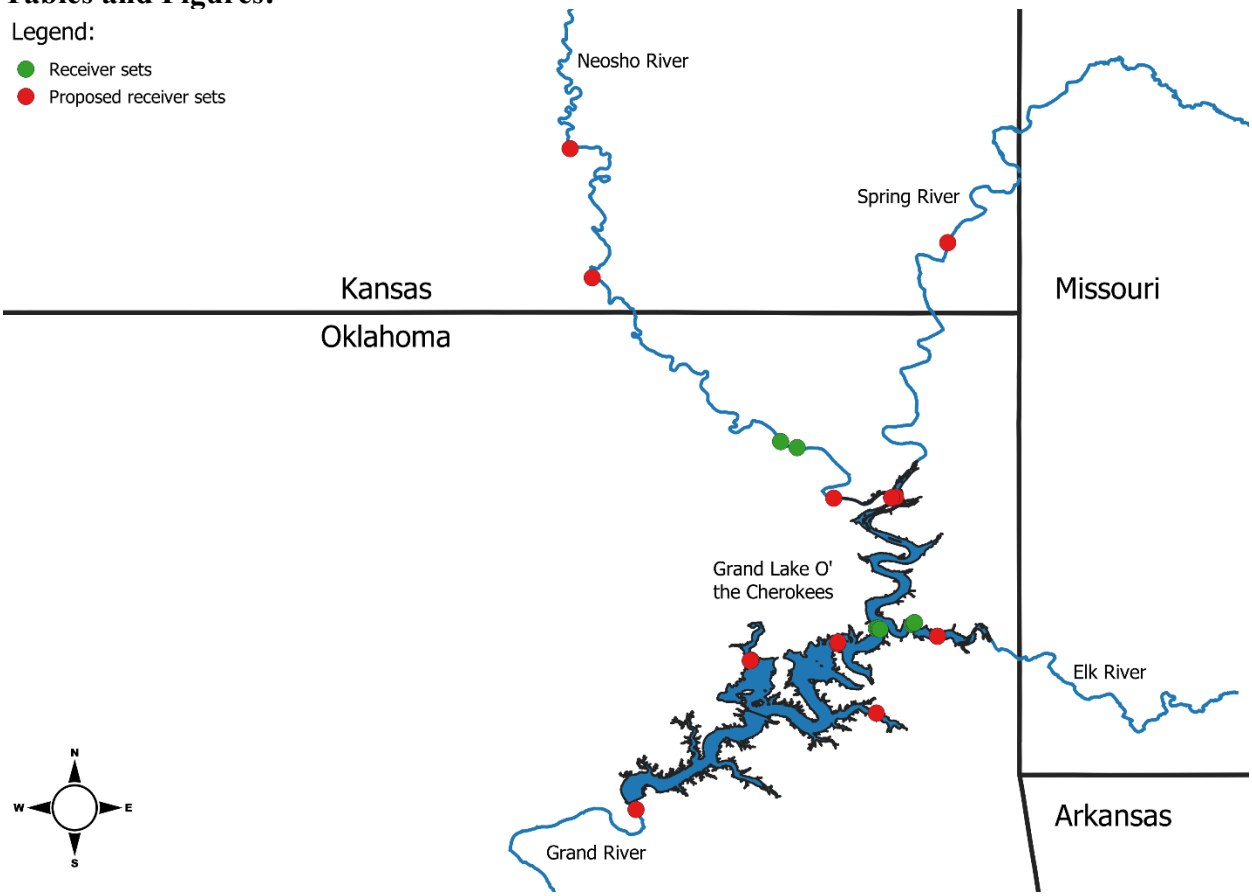


Figure 1. *Map showing locations of deployed receivers in 2024 and receivers expected to be deployed in 2025 in the Neosho River-Grand Lake system.*

Figure 2. *Two of the bighead carp captured and tagged in 2024.*

Recommendation: KDWP recommends to continue the project as proposed. Methods being developed and information gainged in this project are critical to guiding the management and suppression of bighead carp in the Neosho River – Grand Lake system.

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