Project Title: Invasive Carp Movement and Assessment to Inform Management and Removal Efforts in the Lower Mississippi River Basin - Continued

Lead Author, Agency, and Contact Information:

Participating Agencies:

Location of Activities: Reelfoot Lake and vicinity below Reelfoot Lake Spillway

Statement of Need:

Project Objectives:

1. Determine intrabasin and interbasin movement to inform placement of potential deterrent technologies and removal efforts.

Project Highlights:

- 53 invasive carp were surgically outfitted with acoustic telemetry tags.
- Results continue to support that most movement across the Reelfoot Lake Spillway by invasive carp happens at high water, specifically around gage height of 11 feet.
- Invasive carp tagged for this project were detected on receivers in multiple other sub-basins.

Methods:

Vemco VR2W-069k acoustic receivers (n=6) were deployed in Reelfoot Lake in 2022 (Figure 1). Four receivers were placed in Reelfoot Lake, one receiver was placed below the spillway, and one receiver was placed approximately 16 km downstream of the spillway in Running Reelfoot Bayou. Silver Carp were targeted with electrofishing boats and gill nets in April 2022, March 2023, and March 2024.

Silver Carp were implanted with Vemco 16-4x acoustic telemetry tags in 2022 (n=50), 2023 (n=56), and 2024 (n=53) and organized into three separate categories: lake fish, translocated fish, and spillway fish. Lake fish were captured within Reelfoot Lake and released in Reelfoot Lake, translocated fish were captured within Reelfoot Lake and translocated below the spillway, and spillway fish were captured below the spillway and released below the spillway. Receivers were last downloaded August 2024 and are downloaded at four-month intervals.

Results and Discussion:

In 2022, spillway crossings occurred between April 11th, 2022, and May 5th, 2022, when gage height exceeded median daily levels below the spillway and Silver Carp (n=20) were able to cross the spillway, effectively entering or exiting Reelfoot Lake unimpeded (Figure 2). All spillway crossings occurred after gage height exceeded 11 feet.

In 2023, spillway crossings occurred between March 6th and April 6th. Spillway crossings also occurred on August 7th, 2023, caused by a flash flood event in West Tennessee. Like 2022, gage height exceeded median daily levels below the spillway and Silver Carp (n=41) were able to cross the spillway, effectively immigrating and emigrating Reelfoot Lake (Figure 3).

In 2024, spillway crossings occurred between May 22nd and June 6th during a high-water event along with a single spillway crossing which occurred on January 31st, 2024 (Figure 4). Similar to previous years, most spillway crossings occurred when gage height of Running Reelfoot Bayou exceeded 11 feet, although some Silver Carp crossed at a gage height of 10 feet, likely due to jumping behavior or angler snagging.

Most spillway crossings did not occur once water levels decreased below a gage height of 11 feet. The spillway acts as an effective barrier for Silver Carp unless water levels equalize, usually during annual spring floods (Figure 5). Silver Carp tagged in Reelfoot Lake were detected on multiple receivers outside of Reelfoot including receivers in the Mississippi, Ohio, Tennessee, and Cumberland Rivers in 2022, 2023, and 2024. Further tagging and monitoring of receivers in Reelfoot Lake is vital to understanding how Silver Carp immigrate and emigrate various waterbodies.

Tables and Figures:

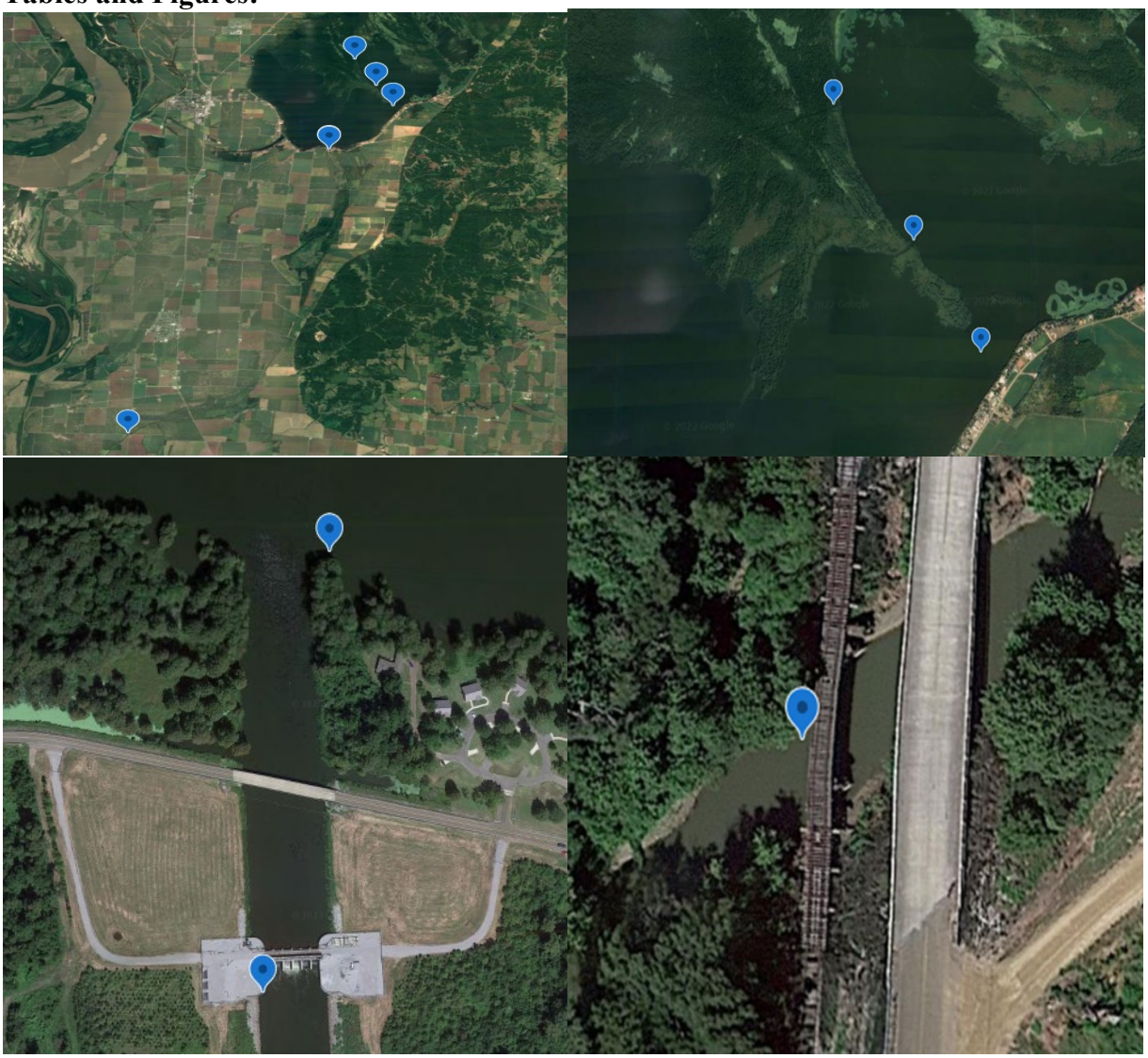

Figure 1. Receiver array at Reelfoot Lake (n=6) with two receivers located at spillway (top left), receiver array in the lower basin (n=3) including receivers at South Shore, Willow Bar Towhead Ditch, and Donelson Ditch (top right), receiver array at the spillway above the spillway (n=1) and below the spillway(n=1) (bottom left), and receiver location in Running Reelfoot Bayou (n=1) (bottom right).

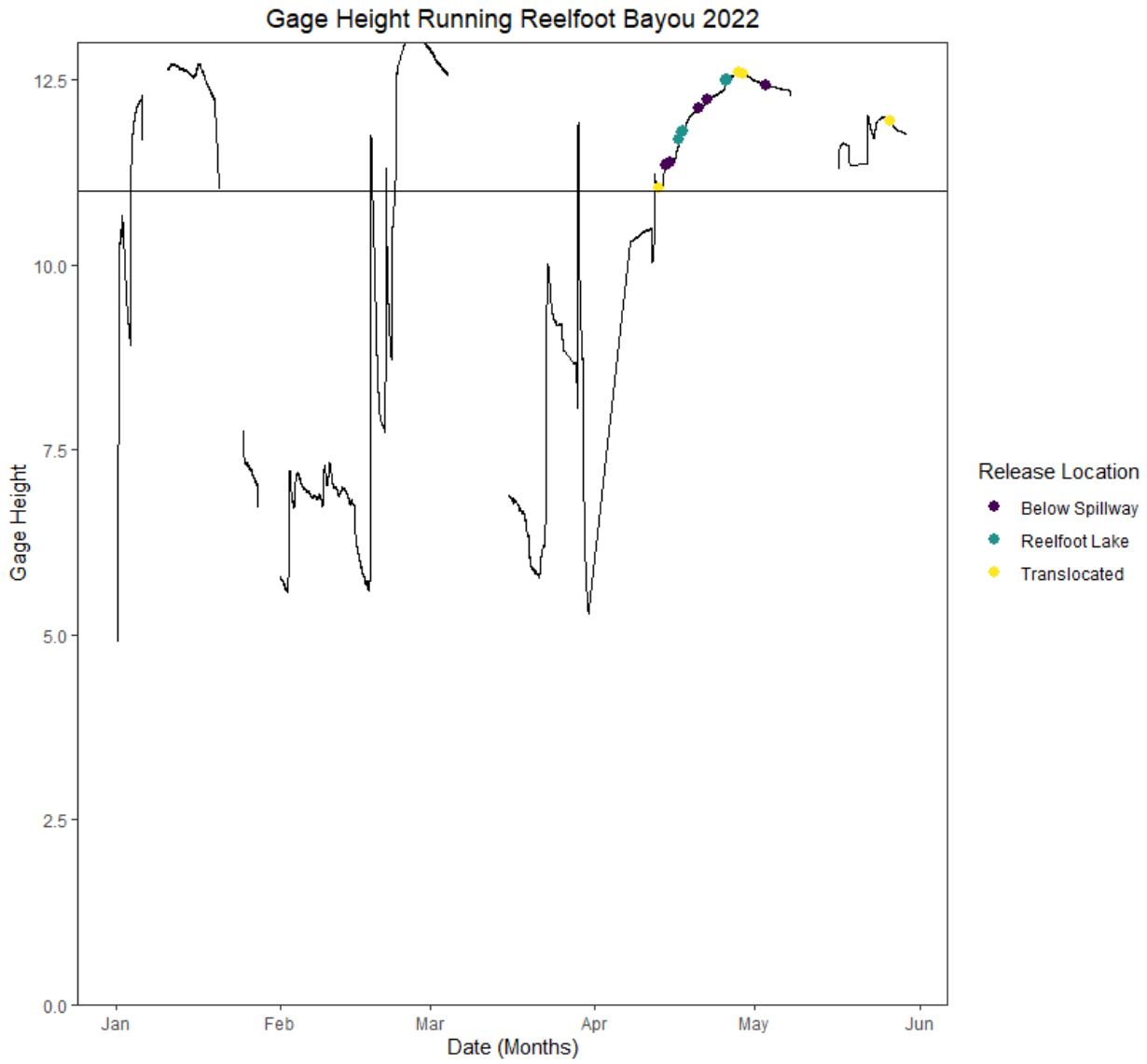

Figure 2. Gage height in Running Reelfoot Bayou between January 1, 2022, and June 30th, 2022. Silver Carp that successfully crossed the Reelfoot Spillway are separated via release location after tagging. The horizontal line indicates a gage height of 11 feet in Running Reelfoot Bayou. Breaks in the graph are due to failure of equipment at monitoring station.

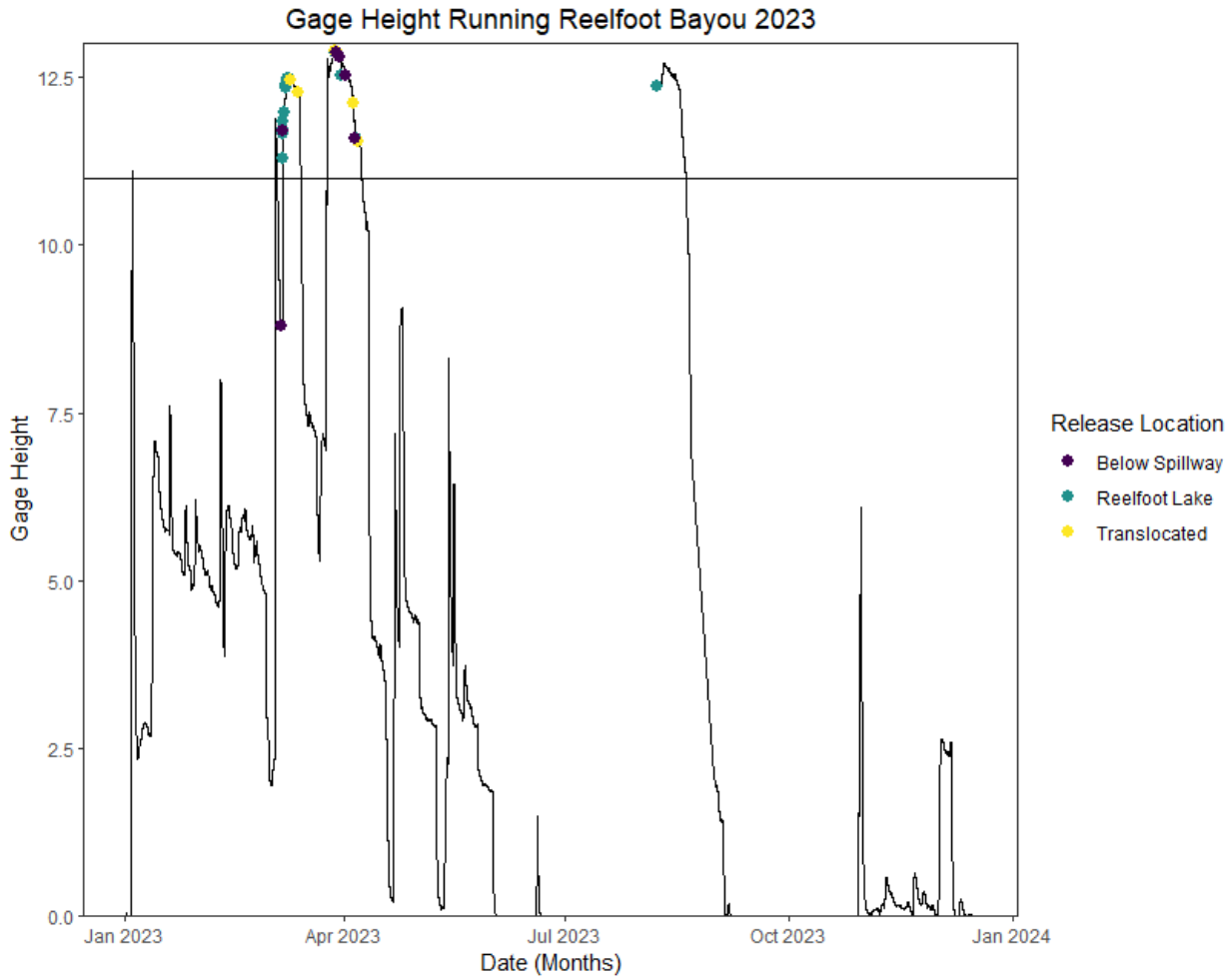

Figure 3. Gage height in Running Reelfoot Bayou between January 1, 2023, and December 31st, 2023. Silver Carp that successfully crossed the Reelfoot Spillway are separated via release location after tagging. The horizontal line indicates a gage height of 11 feet in Running Reelfoot Bayou.

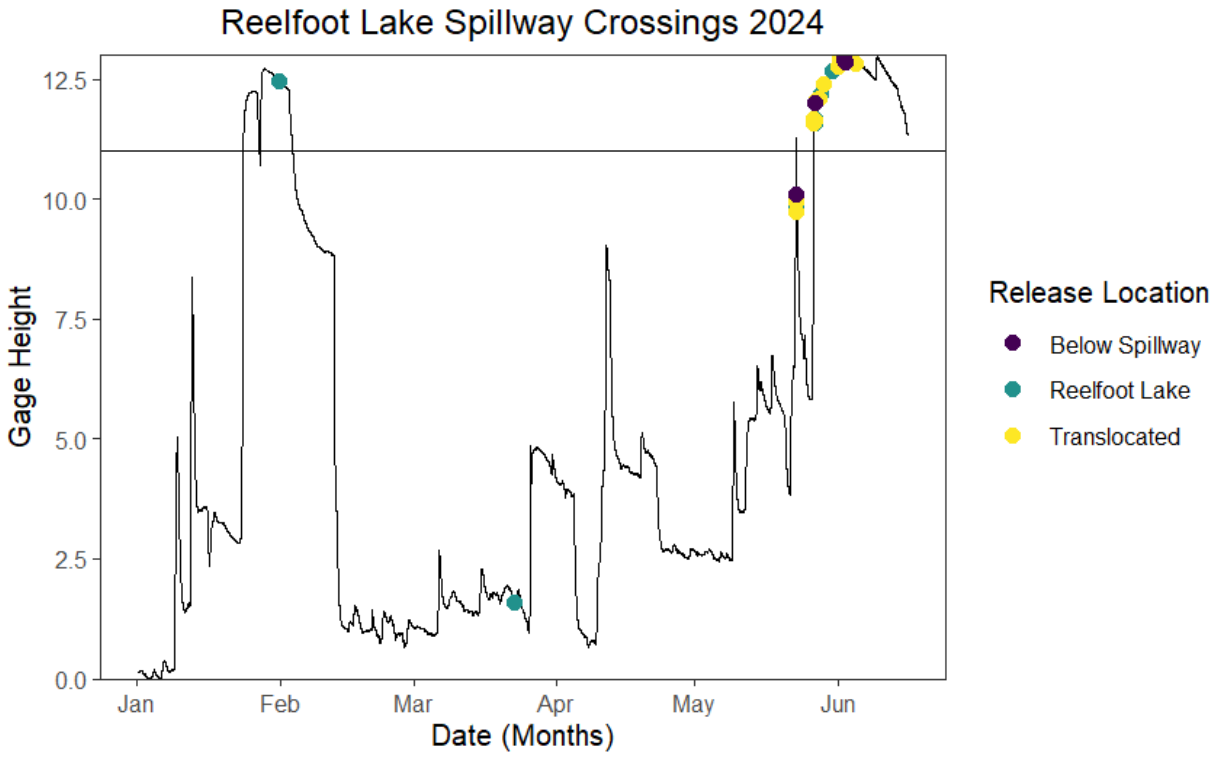

Figure 4. Gage height in Running Reelfoot Bayou between January 1, 2024, and June 2024. Silver Carp that successfully crossed the Reelfoot Spillway are separated via release location after tagging. The horizontal line indicates a gage height of 11 feet in Running Reelfoot Bayou

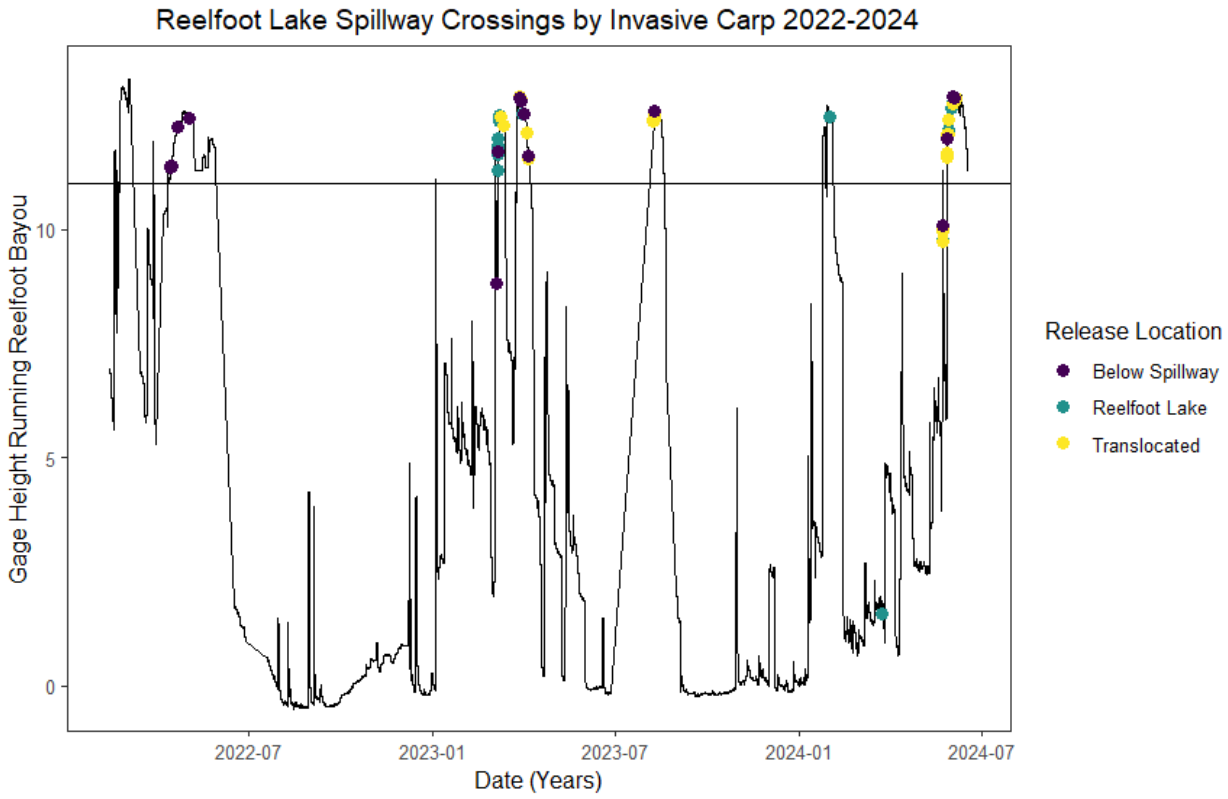

Figure 5. Gage height graphs from 2022 to 2024 indicating potential time periods where Silver Carp immigration and emigration was possible. Horizontal lines represent a gage height of 11 feet where Reelfoot Lake and Running Reelfoot Bayou equalize.

Recommendation:

- Continued tagging and monitoring of movement will provide valuable information of invasive carp movement patterns within the project area and beyond (as demonstrated by detection of tagged carp in neighboring sub-basins).
- Managers should consider more in-depth scoping of feasible deterrent options and management actions (e.g., removals) at Reelfoot Lake and Reelfoot Spillway, weighing the costs/benefits of implementing various deterrent types and determining what level of action is justified based on observed invasive carp presence, abundance, and behavior patterns.