

# Evaluation of Asian carp use of a steeppass fish ladder

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## Introduction

Asian carp continue to be a persistent threat to our Illinois waterways and additional methods that aid their management, control, and removal are being explored. In addition, as various barriers are put in place to limit the spread of Asian carp, impacts on native fish passage is also a concern. Many fish species including Asian carp are attracted by water flow for upstream movements and spawning. To evaluate if this behavior can be exploited for Asian carp removal, we assessed both nonnative and native fish passage using Whoosh Innovations steeppass fish ladder installed at The Nature Conservancy Emiquon Preserve's water control structure.



**Figure 1.** The steeppass connected to the Emiquon pump station at the Emiquon Nature Preserve, Lewiston Illinois.

## Objectives

1. Will fish be able to use the ladder?
2. What factors attract fish to the area and to use the steeppass?

## Study Site

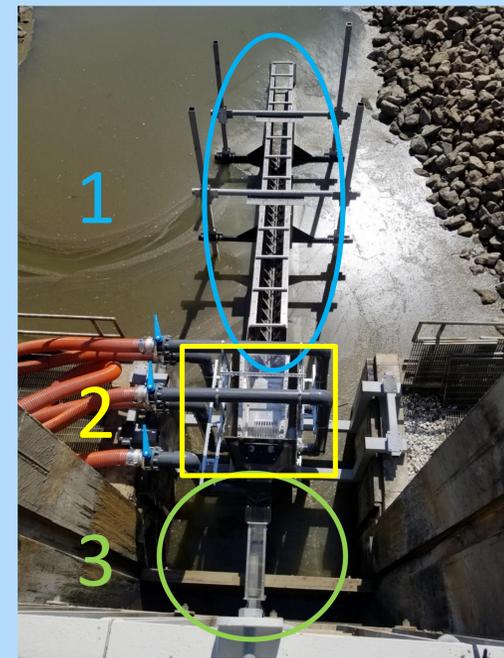
TNC's Emiquon Preserve is a restored backwater located along the Illinois River near Havana, Illinois. In 2017 a water control structure became operational and is being used to actively manage water levels within Emiquon.



**Figure 2.** An aerial photo of the Emiquon Preserve and the pump outflow leading into the Illinois River.

## Fish Ladder Design

This design uses a series of tubes connected to our water source, the pump station at the Emiquon Preserve. When the pumps are on, water from Emiquon fills and runs the system. The main passageway that the fish move through has three parts:



**Figure 3.** Overhead view of the steeppass fish ladder installed at Emiquon. With indicators showing the three main parts.

(1) The first section is the steeppass, this opens into the pump station spillway connected to the Illinois River. Fish enter the passage here and swim up a steep incline to the flow box.

(2) The flow box is directly connected to the water source through a series of valves that control the flow. Water comes into the flow box, down the steeppass, with a smaller amount of water flowing out the false weir.

(3) The false weir is connected to the back of the flow box. Fish exit the flow box out the false weir and into a holding pool, where they will be collected for identification and abundance records.



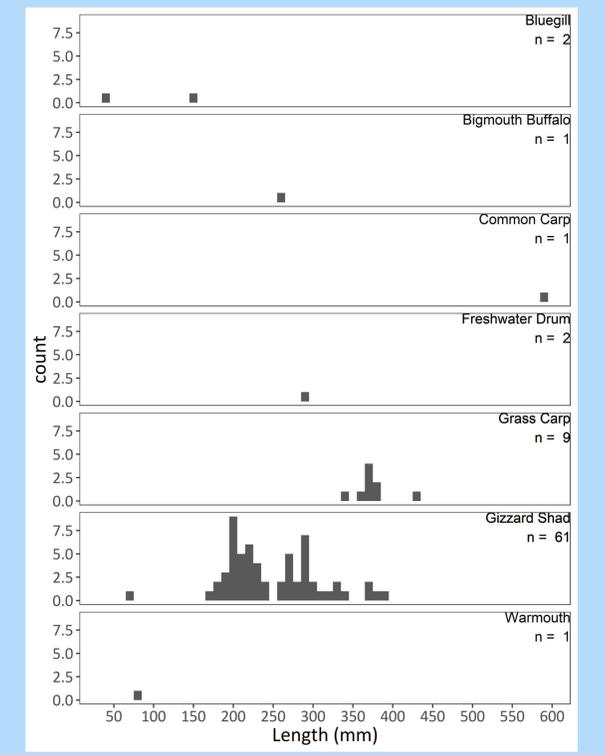
## Methods

- The steeppass was operated from 9/14 – 9/17, 2020.
- All fish were cleared from the holding pool prior to the trial
- 2 internet-controlled security cameras were installed overlooking the false weir and the outlet into the holding pool to record fish passage.
- Chemical and biological parameters were measured before, during, and after steeppass operation. These included dissolved oxygen, temperature, conductivity, plankton abundance, and turbidity.
- At the end of the trial, fish were collected from the holding pool and identified, photographed, measured, and weighed.



**Figure 4.** Photo of two techs, Blake and Kara, using a seine to remove fish from the holding pool.

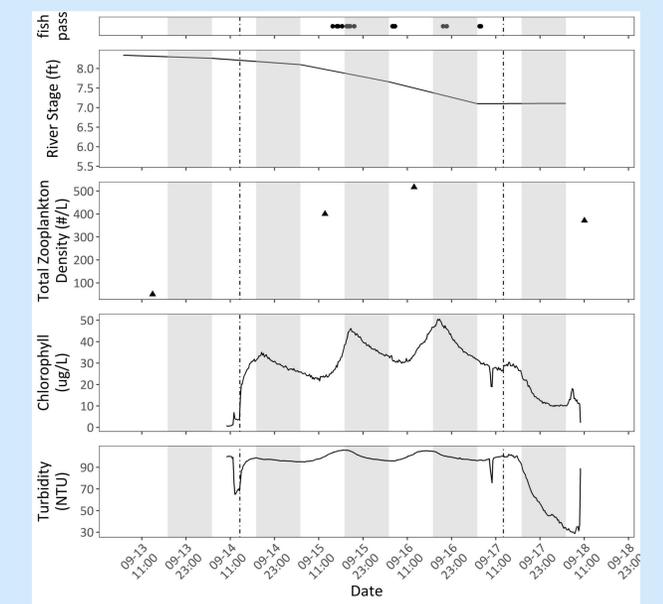
## Results



**Figure 5.** Length histograms of fish that passed over the steeppass by species. Most fish collected were between 150-400mm in length.

## Results Cont'd

- Continuous turbidity and chlorophyll-a measurements taken with a YSI Exo2 sonde in the steeppass spillway show increases in both parameters after pumps were turned on, and declining values after pumping stopped.
- Similarly, total zooplankton abundance increased following the start of the trial, with abundance beginning to decline 1 day after pumping stopped.
- The river stage as measured at the Havana, IL river gauge declined over the course of the trial, ending about 1 ft. lower by the end of the trial.
- Of the fish that were observed on the recorded footage, most crossed up to 1 full day after pumping started.



**Figure 6.** Chemical and biological parameters collected from steeppass spillway during trial. Dotted lines show start and stop times of Emiquon water pumps. Shaded/unshaded regions indicate alternating 12-hour time intervals starting at 6 AM.

## Discussion

- No Bighead or Silver carps passed over the steeppass.
- Only 39.5% of fish (30 of 76) were detected on recorded video footage, likely due to low frame capture rate of cameras used.
- Low water levels may have prevented larger fish from utilizing a plunge pool to launch into the steeppass.
- Spring trials are planned to test during different water conditions and utilizing AI scanner with higher frame resolution.
- Native fish use is promising and could have implications for facilitating native fish passage over barriers meant to prevent the spread of invasive carps.

## Acknowledgements

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