Rivers Suitable for Invasive Carp Spawning: An Illinois Study

Justin Zaleski

University Of Michigan Dearborn

Abstract

This purpose of this study was to determine the feasibility of detecting invasive carp spawning rivers by the use of GIS Mapping. The study focuses on the Illinois watershed due to the prevalence of the invasive carp in the area. Asian carp spawn and hatch in the summer months (late May to early August) in these time zones. Silver and Bighead carp have comparable spawning and hatching requirements: water temperatures of 18–30 degrees C, greater than 7 meters per second river velocity and at least 100 km stream stretch (ACRCC, 2013). Another Parameter that was included in this study is high flood occurrence for carp spread rapidly under flood events. Adjacency to wetlands was also looked at for the carp can infiltrate and damage the fragile ecosystem.

Intro

Asian carp are a new invasive species that threaten the ecosystem of the great lakes and consequently their sport fisheries. Bighead carp and Silver carp are commonly referred to as Asian carp, these large planktivorous fish outcompete native species of fish and muscles. First introduced in the 1970s to manage water quality in aquaculture systems and wastewater treatment facilities, they quickly escaped into the nearby river systems due to unexpected flooding (ACRCC, 2013). Carp have invaded the Mississippi River, Missouri River, Ohio River and southwestern Illinois River (Chick and Pegg, 2001). These carp can grow to be quite large, up to 20 pounds for silver and up to 100 pounds for bighead (ACRCC, 2013). Silver carp are known to leap out of the water at vibrations such as boat motors, this has caused injury to boaters and their families. Declines in native species could occur because Asian carp would compete with prey fish that primarily eat plankton. This will create a bottom up effect that could lead to reduced growth rates and declines in abundance of prey fish species, and thus predatory fish would also likely decline. Asian carp also reduce survival of open-water fish larvae – like those of walleye and yellow perch – most likely through competition for plankton or by preying on the larvae. The fish are dispersed to the great lakes they could disturb the fish web at a detriment level that will cause unforeseeable effects. Economic damage caused by invasive species is well known in the great lakes region, if the carp invades and thrives in the Great Lakes this will be one more nail in the coffin. In their native range these fish are hardy survivors of a wide range of environmental conditions and factors while spawning (e.g., Temperature and Turbidity). In their native habitat the carp require high velocity flows and flood level conditions to spawn, if the eggs reach the bottom of the river they will not survive (ACRCC, 2013). Currents bring carp larvae to slow-flowing backwaters, creeks, reservoirs, or other flooded areas where the fish grow to maturity. Asian carp typically require rivers with 100 km or more of undammed flowing water for successful reproduction, although it now appears they can spawn in a great variety of places (Murphy, 2013). The carp spawn as the carp have easily adapted to our northern climate the immediate threat is located in the river systems, and the disruption that they cause in aquatic food webs. The major ecological consequence resulting from the establishment and spread of Asian carp into the Great Lakes would likely be an overall decline in certain native fish species, including some commercially and recreationally important ones (Chick and Pegg, 2001).

Study Area

First the high flood occurrence areas were mapped out, then flood zone adjacency to the high flood areas were selected and exported. Next wetlands were added to the map, flood zones were exported that intersected the wetlands during flood events this would satisfy requirement that the carp would invade the wetlands during flooding events. Next the NHDH data was extracted from the sites that met the previous requirements, USGS sample site point data was added to the potential carp rivers. Next the NHDH data was dissolved and the river distance was calculated. From there river length, temperature and discharge was added to the table of the NHDH data, This data was taken from all possible sites on the river and averaged. Site point data was used to generate the velocity as stream width was not known. The velocity of the stream was calculated by taking the average water height and using the measure tool to determine stream width at the sample site. The equation for velocity was V = D/(Depth * Width). Streams that met the requirement for carp spawning were selected and exported.

Methods

In the end there were 5 rivers that fit the description of the potential carp spawning river: Illinois river, Kickapoo Creek, Rock river, Mississippi river, and Spoon Creek. This project can help in future carp eradication and prevention efforts, these streams and surrounding wetlands should be monitored and when a substance such as a chemical is developed to kill carp eggs or disrupt spawning behaviors should, that substance should be applied to the streams in question. There was some limitations to this project as the USGS has limited resources and does not have historic temperature for all USGS sites. This created a bias to the rivers that had temperature data. This project could be verified by physically sampling the sites for Edna of the carp, this would test for the carp presence in the water ways. Ultimately I believe my study to be an success as reports have confirmed presence of carp in the spool and Illinois rivers.

Discussion

References


