

## Asian Carp in Midwestern Waters: An Exploration of the Threat and Potential Solutions

When the Fish and Wildlife Service imported Asian Carp into Arkansas, they intended only to control vegetation in aquaculture ponds. Nevertheless, nearly 60 years later, Asian Carp have decimated biodiversity up and down the Mississippi River, creating massive problems for the citizens of the central United States (“Timeline for Asian Carp in the USA”). These carp have slowly worked their way upstream, now threatening to enter the Great Lakes, which would effectively ruin the water supply that much of the U.S. and Canada rely on. When studying issues of sustainability, invasive species are rarely taught as a primary concern. Students in environment-related fields, like myself, are not given the opportunity to explore the need for invasive species control. Therefore, I will use this report to present my research into how and why Asian Carp are a problem, and which areas of the Midwest are at risk. In the past few decades, many solutions have been proposed and implemented. This report will also explore many of these solutions, their viability, and some of the logistics involved in implementing them effectively.

There are four types of Asian Carp that currently plague U.S. waters. Grass carp were imported in 1963 to assist in research on natural ways to control vegetation in aquacultures. Many carp escaped from this facility within three years of their arrival. Despite these escapes, bighead carp were introduced for similar research purposes in Arkansas in 1972. The next year, silver carp and black carp followed suit. These carp were constantly escaping, and since the plankton and algae they fed on was plentiful, they were quickly considered an established species in the wild waters of Arkansas. All this time, carp were escaping, reproducing, and

monopolizing the food sources available in the Mississippi River and no one cared enough to try to prevent it. The Lacey Act is what currently prevents fish from being transported between bodies of water to prevent invasive species from popping up (Lacey Act). While the act was initially published in 1900, it was really only meant to stop illegal trading of fish and wildlife. It was not amended to stop the spread of invasive species until 2008, so no one was technically breaking the law by recklessly letting invasive fish escape throughout the 70s and 80s (Koenig). By the early 90s, researchers were beginning to truly understand the impact Asian carp had on the ecosystems they had invaded. Asian carp outcompete nearly every native species present in the waters they now occupied. Native species continue to die off in massive numbers due to a lack of food. Plus, Asian carp can lay as many as one million eggs in a year, allowing their population to grow exponentially. Coincidentally, at the same time that researchers began studying the effects of the carp in the early 90s, there were enormous floods throughout the Midwest. (“The Invasion”). These floods allowed the carp to migrate into the Missouri River and the Illinois River. This brought up concerns regarding how far the fish would migrate; and if they could make it as far as the Great Lakes, no one could predict the disaster they would carry with them.

Keeping the Asian carp out of the Great Lakes has been the agreed-upon ultimatum in the scientific community. Several studies have shown that Asian carp could thrive in the Great Lakes if given the chance (Stopping Asian Carp). It took mere decades for the carp to overtake the Mississippi River, the same could happen if they aren’t stopped from getting into the lake. If the fish were to establish themselves in the lakes, they would easily outcompete all the other species for zooplankton, phytoplankton, and algae (“Asian Carp”). These are the food sources many native species rely on for sustenance. Grass and common carp are both bottom feeders, while

bighead and silver carp are filter feeders. All four species consume similar diets of plankton and algae in every part of the body of water, so they have monopolized all the food available (Varble and Secchi). Once the populations of fish reliant on this microscopic sustenance deplete, the entire ecosystem of the lakes will be broken. The Great Lakes would become a gray shell of what they once were. On a large scale, the \$7 billion fishing industry would be destroyed if all there is to fish for is bony carp. Plus, since the fish can jump up to 10 feet out of the water, they are known to hit and injure fishermen. On a less obvious scale, the destruction of biodiversity in the lakes would completely change the underwater habitat to a desolate wasteland by corrupting the food chain and changing the nutrients present in the waters (Sackman). Luckily, only a few grass carp have been found in Lake Erie with no proof of reproductive actions in the area. Other than that, the lakes have not yet faced invasion by the Asian carp. Nearly all the efforts to control the fish revolve around preventing them from entering the Great Lakes via the Chicago River into Lake Michigan or other major routes. If Asian carp were to begin reproducing the Great Lakes, the economy around the fishing industry would collapse and our rare gift of access to a large and safe freshwater source may be compromised.

There has been a myriad of solutions implemented in the last thirty or so years in attempts to undo the spread of the carp throughout the Mississippi watershed. These measures have included installing underwater electric fences, poisoning long sections of the river, and modifying dams to prevent the carp from moving towards the Great Lakes. The Army Corps of Engineers in Romeoville, IL have been maintaining the electric field along the Chicago Sanitary and Ship Canal (Boissoneault). This field effectively serves as an electric fence to prevent Asian carp from coming anywhere near Lake Michigan. Researchers monitoring this project believe the electric fence to be effective even though there have been at least two instances of Asian carp

caught beyond the fence in the last decade. As previously mentioned, these carp are very quick breeders, so even a few Asian carp slipping by is a serious risk to the region. Bighead carp specifically comprise up to 97% of the Mississippi River's biomass; it remains unclear whether underwater electric fields alone truly have the capacity to fight such a huge threat (Reeves).

Another method that has been utilized in the canal specifically has been mass poisonings. The purpose of the largest scale poisoning in 2009 was twofold: to get an idea of how many carp were actually passing through the Chicago Sanitary and Ship Canal and to hold down the cost while maintenance was done on the electric field. Necessary maintenance was done on the electric barrier in December of 2009. While the electric currents were turned off, officials poured more than 8000 liters of rotenone into a 9 km section of the canal. Rotenone is a plant-based fish poison that is only "mildly toxic" to humans (McKenna). This act resulted in tens of thousands of fish dying in the canal; only one of the dead fish was an Asian carp. This means that the dwindling numbers of native fish were destroyed in an attempt to save them from the carp, yet officials failed to see the hypocrisy of their actions. Using DNA tests, authorities found that there had been evidence of Asian carp present in the canal recently. Another round of poisoning was approved for May of 2010. This time, the poison was dropped in the Little Calumet River on the South side of Chicago. This time, not one Asian carp was found in the 100,000 pounds of dead fish that resulted from this poisoning event (Nels). Plus, "mildly toxic" rotenone was poured into the water in a community that already bears the brunt of much of Chicago's environmental injustice. These poisoning events have done next to nothing for the sake of the fight against Asian carp. It is safe to say that this is one of the least effective ways to give the Midwestern waters back to native populations.

One of the most advanced solutions that is currently implemented comes from the Minnesota Aquatic Invasive Species Research Center (MAISRC). Research was done at the center to figure out the best way to modify dams along the Mississippi River to prevent Asian carp from migrating northwards without hurting native species. Initial research showed that carp are relatively weak swimmers when it comes to “peak swimming,” or swimming up and over a barrier. It also found that since Asian carp have a strong sense of hearing, sound deterrents may be a beneficial direction to go in. This research lasted from 2014 to 2018 and has led to innovation and collaboration with the Army Corps of Engineers. The MAISRC has given recommendations to the U.S. Army Corps of Engineers on how to adjust spillway gate operations to allow less carp to pass through (Sorensen). The MAISRC also successfully installed the first acoustic deterrent fence to combat the carp invasion. After initial success of this acoustic barrier, more were engineered and installed in places all down the Mississippi River; one in Southern Kentucky has even added a flashing lights element to further confuse the carp (Wilkins).

While all these solutions are effective in their own way to some degree, one of the most popular solutions across the board is simple: fish Asian carp out of existence. In China, Asian carp species have been fished and eaten for over a thousand years (Upholt). Many have seen the expanding carp population as a business opportunity. There have been several approaches regarding what to do once the carp are caught: cook and eat them locally, export them to Asian countries accustomed to eating these carp, process them and use them as bait for other fishing endeavors, and more (Upholt). While all could be potentially viable, keeping the fish local and eating them in the United States is the most sustainable of the options. In this “invasivore” movement, there are chefs like Chef Philippe Parola focused on creating unique ways to serve up

the carp as well as entrepreneurs like Lanchi Luu and John Crilly who took their experience in academia and invested in carp processing plants (Vable and Secchi, Upholt). One of the biggest issues with carp consumption is the difficulty in processing. Asian carp are excessively bony with large Y-shaped bones that make it difficult to create fillets (Greenberg). Innovation by companies like FIn Gourmet, the company started by Luu and Crilly, have spent years figuring out the “optimal technique for harvesting boneless fillets” (Upholt).

After creating an effective way to process Asian carp, it was the primary task of innovators to get the public to actually eat it. Since fish had been declared a despicable invasive species, the general public would not jump at the opportunity to taste a problematic river fish. What many fail to realize is that Asian carp are quite delicious, similar to the taste of a grouper (Greenberg). FIn Gourmet found that fillets sell really well, and with leftovers from the fillets, creating traditional fish cakes was a huge hit among the Asian-American population in Atlanta, where they are based. Plus, with the tiniest scraps left from those two endeavors, the company makes dog treats (Upholt). This is a perfect closed-loop system where the invasive fish is removed, then every single part of it is used. From a marketing angle, getting a larger population on board with trying the fish has proved a struggle. Varble and Secchi conducted an entire study on the viability of Asian carp as a marketable menu option and found that the vast majority of people polled would be willing to try a sample of Asian carp. They also found that marketing it as a “seafood” dish rather than specifically carp was extremely effective. One other important element of reframing Asian carp as a palatable dish is the taste. Since Asian carp are a river fish, they are often quickly associated with the muddy taste of bottom-dwelling river occupants. Asian carp manage not to have such a dank taste. Especially when eating silver and bighead carp, this muddy taste is nearly nonexistent, for they are filter feeders that do not ingest mud in the first

place (Varble and Secchi). So, with all of this considered, eating the carp out of existence may be the most sustainable and cost-effective way to prevent Asian carp from wreaking any more havoc on our North American waterways.

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