The Asian Carp Threat to the Upper Mississippi and Great Lakes Ecosystems - A Perspective

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Asian carp in the Mississippi River Basin

- Asian carp were introduced in Arkansas in the 1960's and 70's by and for fish farmers to control vegetation, plankton and most recently snails in catfish rearing ponds.
- Escape or release from fish farm ponds and some intentional stocking occurred after that.
- Bighead and silver carp became established in Arkansas waters prior to the 1990s, and broodfish had reached Missouri waters by the early 1990's.
- The flood of 1993 provided extensive spawning and rearing habitat for floodplain fishes.
- We suspect that the flood gave the Asian carp the opportunity needed to attain high survival rates and become established.

Asian Carp in the Mississippi River Basin (slide 2)

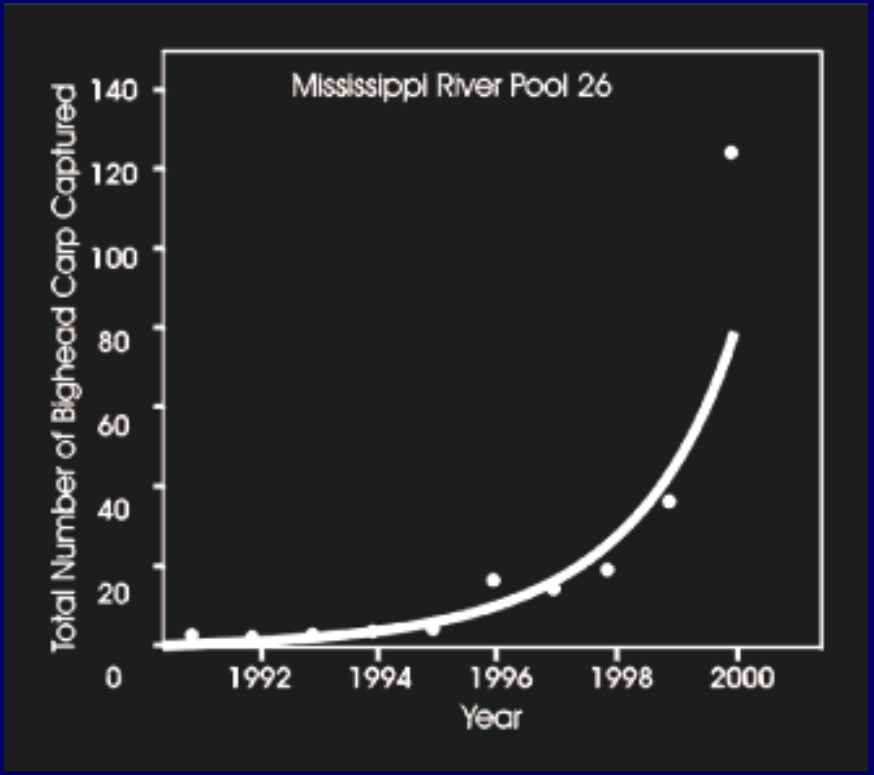
- A fall, 1999, fish kill investigated on off-channel waters of a National Wildlife Refuge near St. Louis documented 97% Asian carp and only four native species, represented by only one individual each.
- A similar fish kill was documented in 2000.
- At the same time reports began coming in of commercial fishermen abandoning fishing sites because they were unable to lift nets that were “loaded” with large Asian carp.

Asian carp in the Mississippi River Basin (slide 3)

- Scientific data collected by the Upper Mississippi River Long Term Resource Monitoring Program documented a 100 fold increase in Asian carp numbers in Pool 26 between 1991 and 1993.

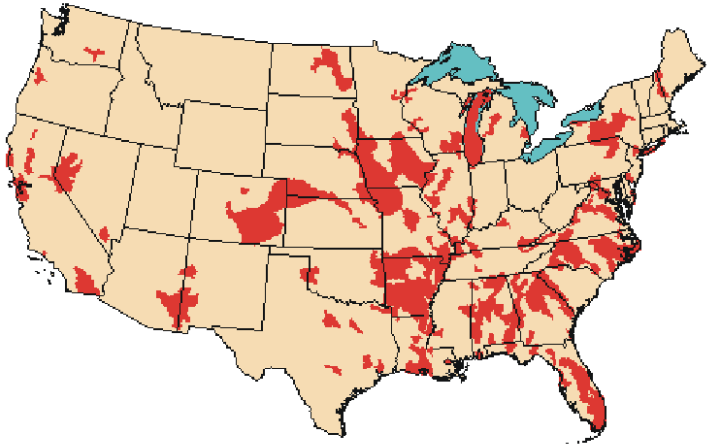
- In the adjoining LaGrange Pool of the Illinois River these data documented a 600 fold increase in Asian carp numbers between 1999 and 2000.

- Commercial harvest increased from 5.5 tons in 1994 to over 55 tons per year since 1997.



Data Source: Upper Mississippi River Long Term Resource Monitoring Program

Grass Carp

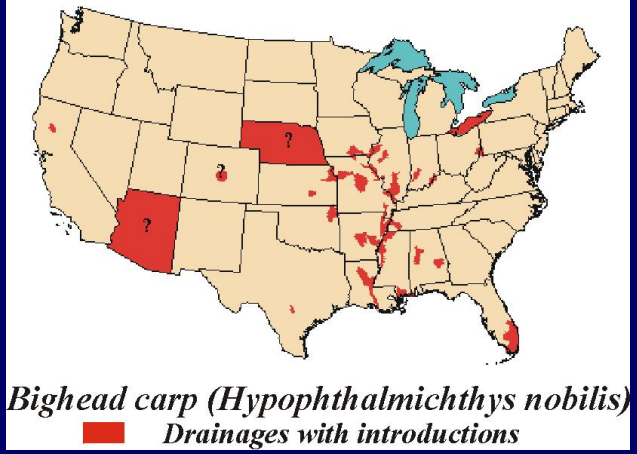


- Imported into the U.S. from Taiwan and Malaysia in 1962.
- Native to Eastern Asia (25-65^{o} North latitude), including parts of Siberia.
- Consumes higher aquatic plants, submerged grasses, detritus, insects and invertebrates.
- Grows to 59 in. in length and weights of 100 pounds.
- Widely stocked (both legally and illegally) in 45 states for aquatic vegetation control.
- Triploid stocking was used to control reproduction, but natural reproduction in the wild has been documented.

Grass Carp Impacts

- Compete for food with native invertebrates and fishes.
- Change the composition of macrophyte, phytoplankton, and invertebrate communities.
- Interfere with the reproduction of other fishes and modify preferred fish habitats.
- Contribute to lake enrichment and eutrophication.
- Disrupt food webs and trophic structure.
- Introduce non-native parasites and diseases.

Bighead Carp



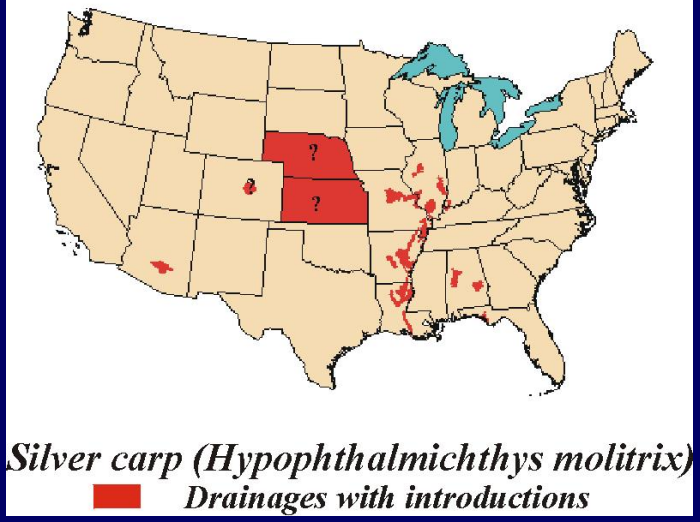
Bighead carp (Hypophthalmichthys nobilis)
Drainages with introductions

- Imported into the U.S. from China in 1972.
- Native to the large rivers and lakes of Eastern China (18-64^{o} North latitude), including parts of Siberia.
- Consumes phytoplankton and zooplankton.
- Grows to 39-40 in. in length and weights of 50+ pounds.
- Used by southern fish farmers to control plankton in catfish ponds and to increase production.
- Released or escaped from fish ponds and is reproducing naturally in many Mississippi River Basin rivers.

Bighead carp Impacts

- Reproduce in large numbers, grow to large size quickly (out of range of native predators), and compete with all species of young native fish and mussels for food and space.
- Compete for food with adult paddlefish, bigmouth buffalo and gizzard shad.
- Disrupt food chains and potentially deplete zooplankton populations.
- Disrupt commercial fisheries by displacing species and clogging nets with unwanted fish.

Silver Carp

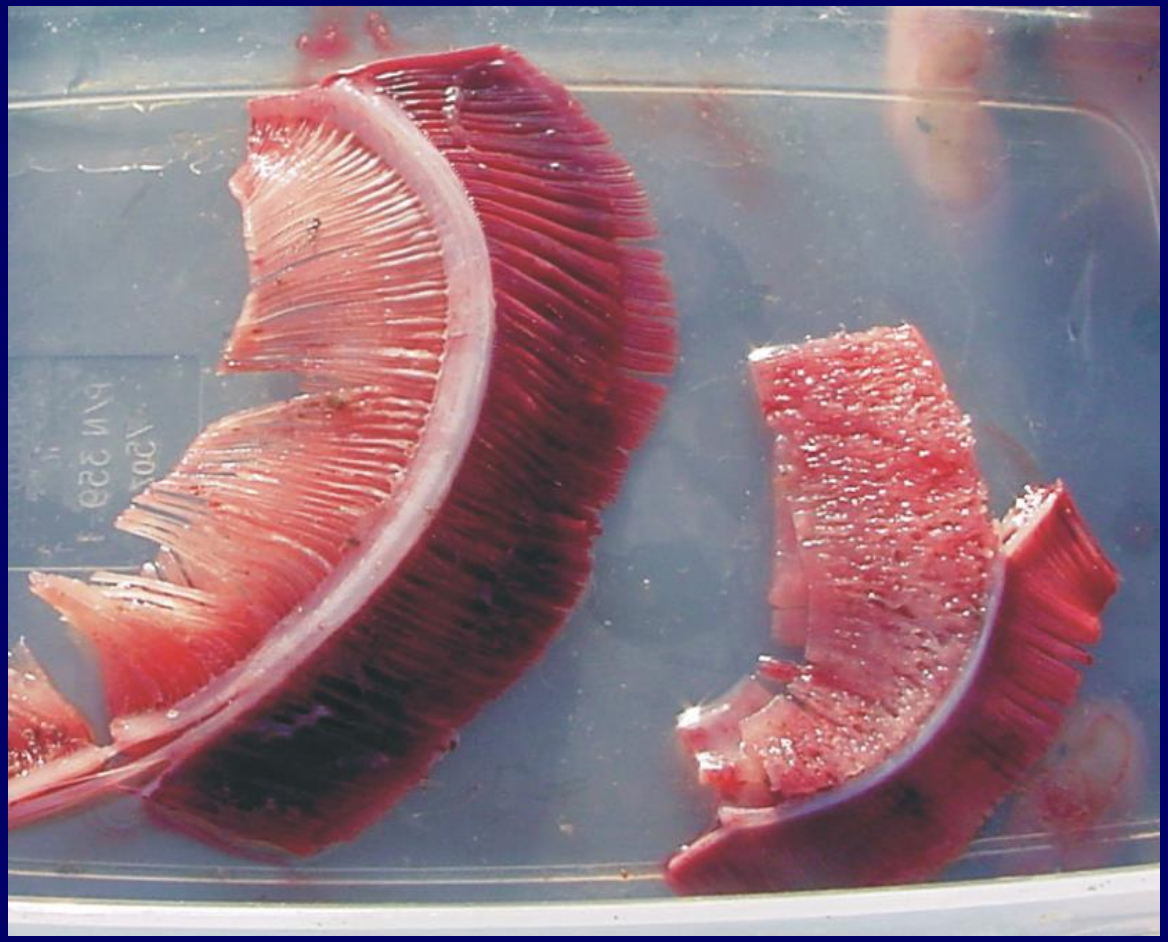


- Imported into the U.S. from China and Eastern Siberia in 1973.
- Native to the Amur and other lowland rivers of China (43-64º North latitude), including parts of Siberia.
- Consumes phytoplankton and zooplankton, similar to the bighead, but is more efficient, straining suspended material as small as 4 microns in diameter from the water.
- Grows to 39-40 in. in length and weights of 110 lbs.
- Escaped from captivity as did the bighead carp.
- Very active, mobile species capable of multiple spawning events and reaching large population size in a short period of time.

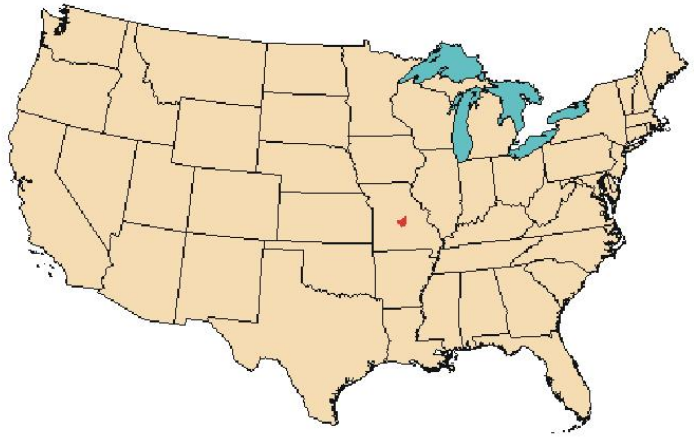
Silver Carp Impacts

- Reproduce in large numbers, grow to large size quickly (up to 12 in. in one year), and compete with all species of young native fish and mussels for food and space.
- Compete for food with adult paddlefish, bigmouth buffalo and gizzard shad.
- Disrupt food chains and potentially deplete zooplankton populations.
- Disrupt commercial fisheries by displacing species and clogging nets with unwanted fish.

Bighead (left) and Silver Carp (right) Gill Rakers



Black Carp



Black carp (Mylopharyngodon piceus)
Drainages with introductions

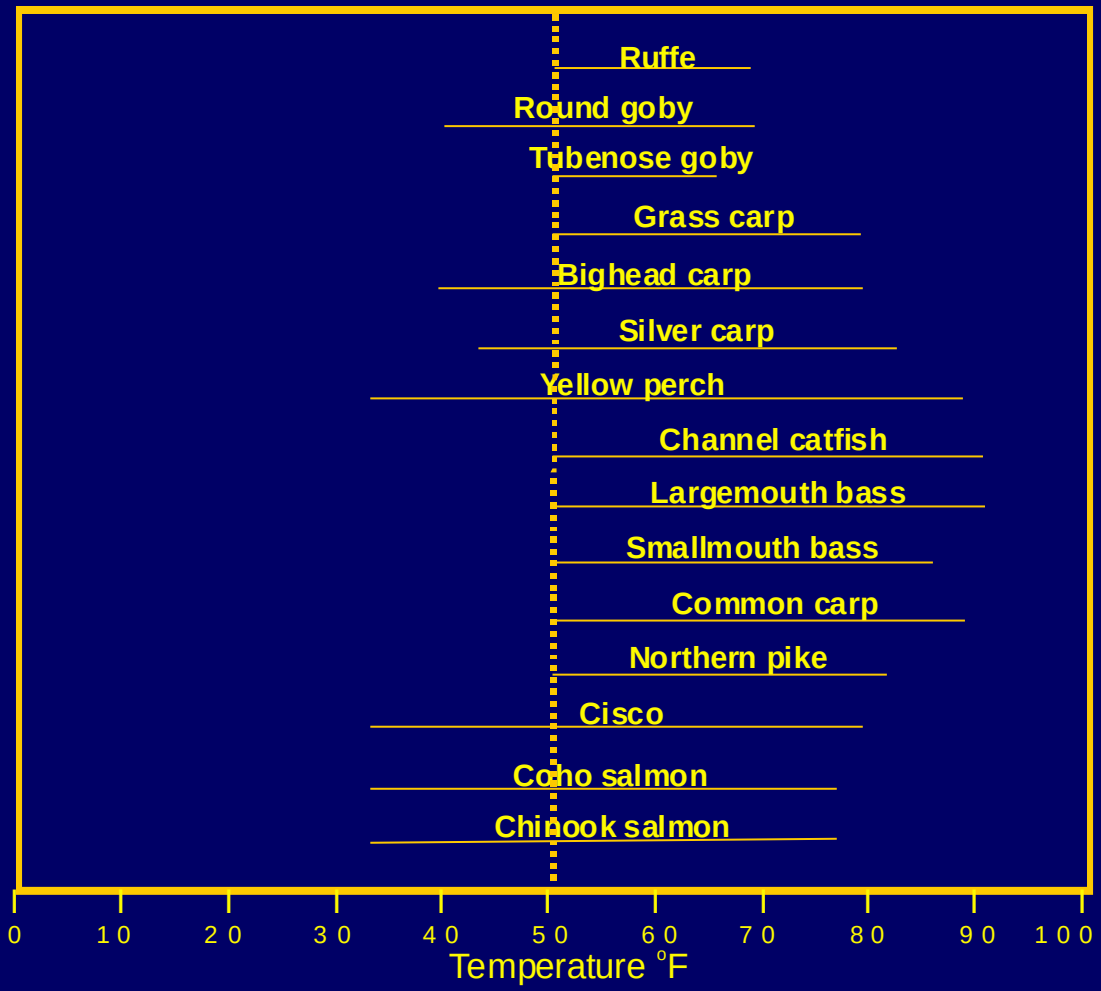
- **Imported into the U.S. from China as a contaminant in grass carp stocks in the 1970s, and then intentionally in the 1980s.**
- **Native to most large rivers of China and far Eastern Russia (15-53º North latitude).**
- **Consumes mollusks and crustaceans.**
- **Grows to 30-40 in. in length and weights of 70 lbs.**
- **Remains in captivity and is used to control snails in fish culture ponds in the South. A small number reportedly escaped from a fish culture pond in the Ozarks during the 1994 flood.**
- **Triploid stocking is being used as a safeguard.**

Black Carp Impacts

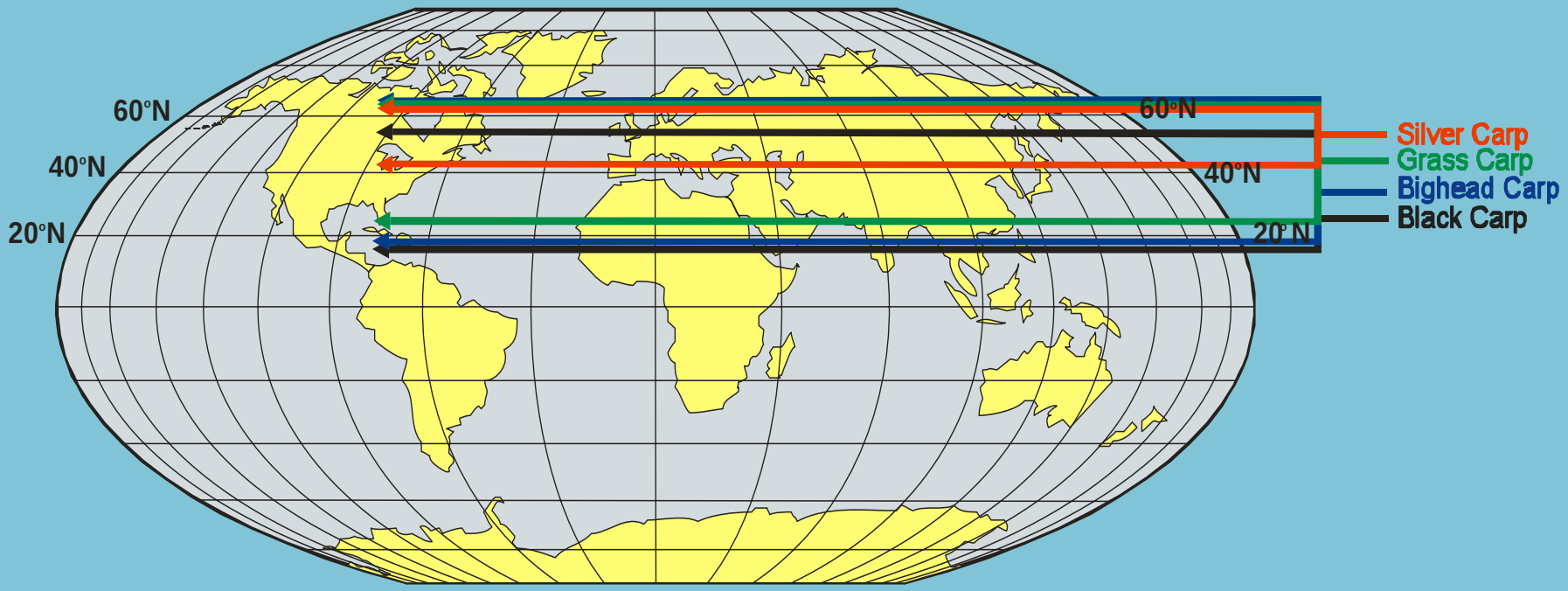
- **Escape to the wild is imminent.**
- **Its food habits, native range, and large adult size pose major threats to native North American mollusks and crustaceans, many of which are threatened or endangered.**
- **Its similarity of appearance to the grass carp makes escape by contamination of grass carp stocks likely.**
- **Use of triploid stocking has not proven effective for grass carp and will likely not prove effective for black carp either.**

Asian Carp Temperature Preference

- Asian carp prefer temperature ranges similar to those preferred by yellow perch, salmon, trout, goby and ruffe.
- As such they seem well suited to invade the Great Lakes ecosystem.



Data Source: Fishbase: www.fishbase.org



Latitudinal range of Asian carp in China projected to North America.

Asian carp in the Great Lakes

- Two bighead carp have already been reported from the Great Lakes. The one shown here weighed 40-50 lbs. and was collected in a net during 2000 from Lake Erie by scientists at the University of Guelph.

- A third specimen was reported from a fountain in downtown Toronto.

- It is thought that the source of these carp was from interstate shipment of live Asian carp through the U.S. to Canada for use as food by persons of Asian ethnic origin living there.

- A concern among scientists and fishery managers in Canada is the Asian religious custom of enhancing one's fortune or karma for the next life by releasing one live fish for every one eaten!

Asian Carp Threat to the Great Lakes

- Most Asian carp species tolerate or prefer cool water temperatures (some well into the range of salmon and trout).
- They are all very prolific, spawning in moving waters.
- They all grow quickly to very large sizes (up to 12 in. in one year), reaching maximum weights of 50-110 lbs.
- Collectively, they consume large quantities of plankton, vegetation and crustaceans - destroying food and habitats for native species.
- As numbers increase, they are capable of tying up huge amounts of biomass.

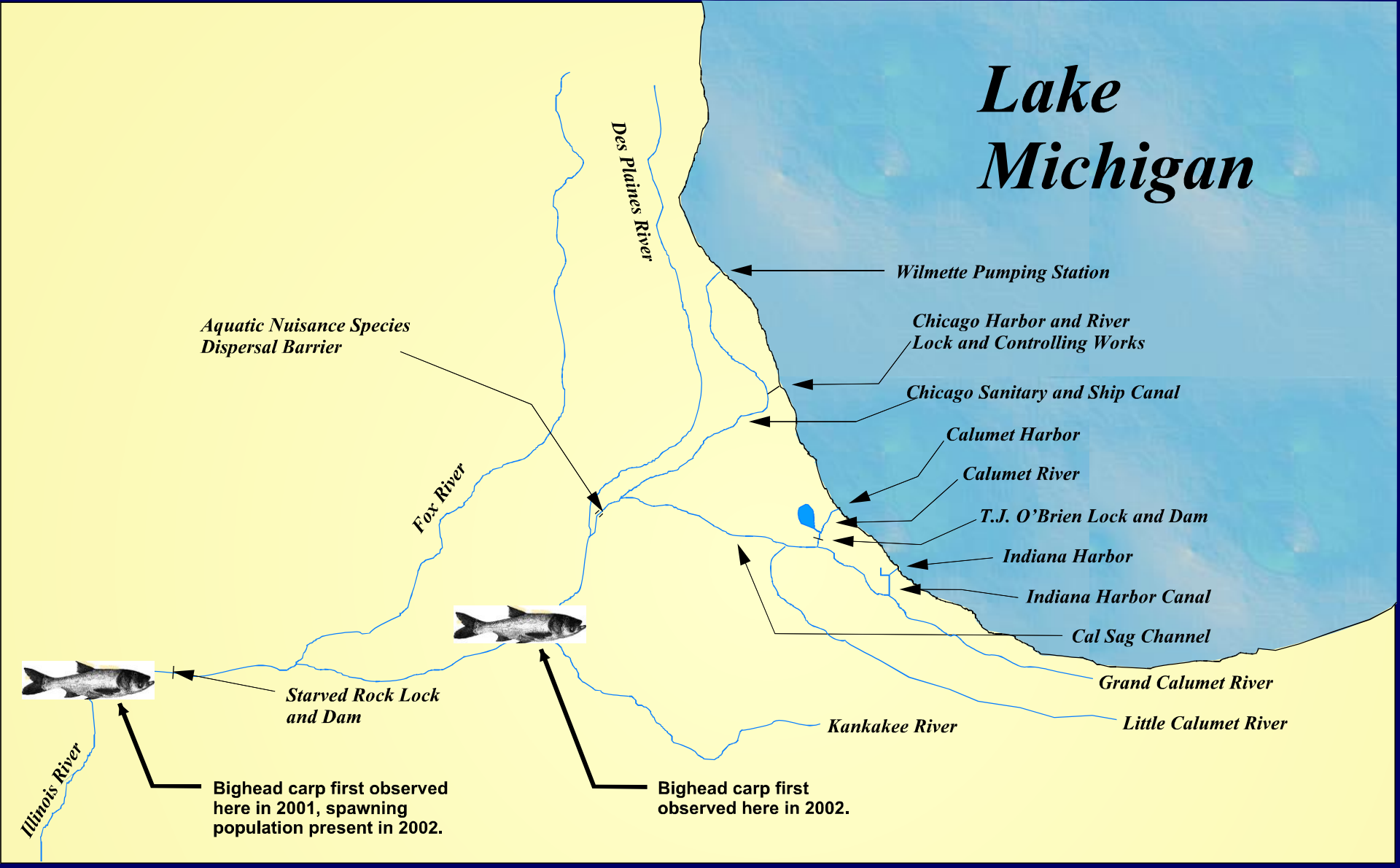
Closing the Pathways of Invasion

- **PREVENTION, PREVENTION, PREVENTION: Keep them out of the country in the first place.**
  - Tighten importation and interstate transport regulations.
  - Maintain clean species lists.
  - Educate the public on the risks of releasing new species.
  - Increase fines and penalties for intentional illegal releases.

- **If still in captivity, destroy all existing stocks.**

- **Close all avenues of escape or transportation from infested areas.**
  - Increase regulation of the the fish farming, baitfish and aquarium industries to control shipment between watersheds.
  - Increase regulation of baitfish collection by fishermen through an improved education and permitting program.
  - Prevent escape through man-made waterway connections and canals.
  Install organism barriers.
  Improve water and waste treatments.
  Modify the navigation system.
  Separate watersheds through hydraulic measures.

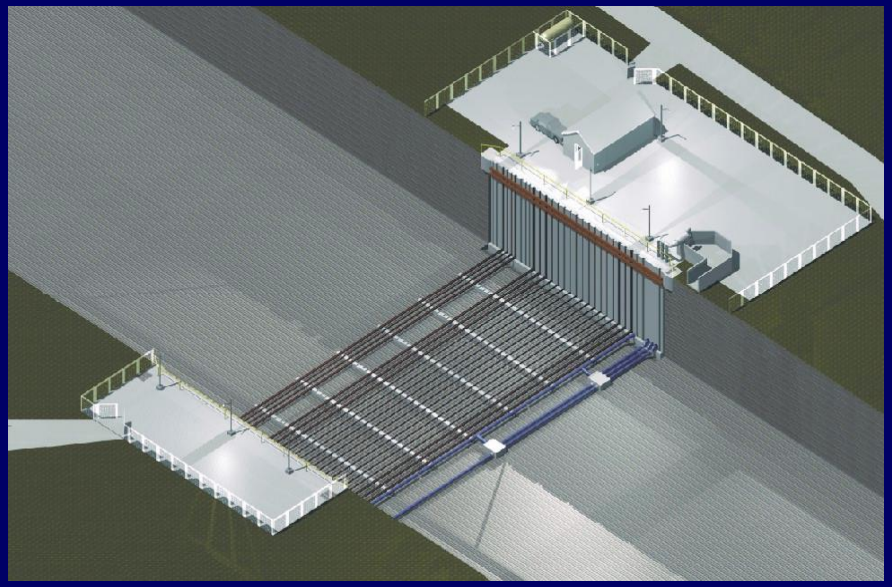
Waterway Connections



Cal-Sag and Chicago Sanitary and Ship Canal showing details of the connection to the Mississippi River Basin via the Illinois River, the location of the Aquatic Nuisance Species Barrier, and the upstream movement of Asian carp from 2001 to 2002.

Organism Barriers

- **Thoroughly test the existing electric barrier for a wide range of fish species representing all sizes of fish.**
- **If necessary, adjust electrical charges and/or construct additional barriers to increase efficiency to 100%.**
- **Test other technologies (i.e. chemical, pheromone, bubble, toxic, anoxic, etc.) that will deter or kill <u>all</u> aquatic organisms attempting to move upstream or downstream in the Canal.**



Water and Waste Treatment Measures

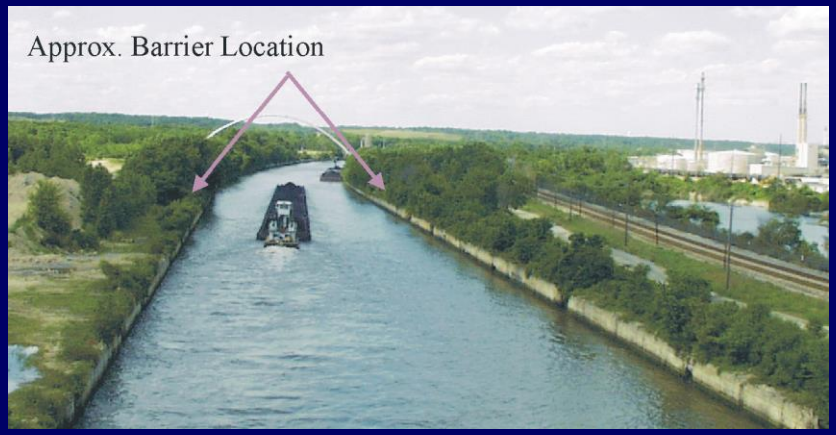
- Temporarily allow water quality in a two or more mile reach of the canal to go toxic or anoxic as it was in the past.
- Send all diversion water through Chicago's water treatment works before being released into the Illinois River and Waterway.
- Enhance Chicago's ability to treat its waste and runoff waters in order to return them to Lake Michigan; eventually eliminating the need to divert wastes down the Illinois River.

Navigation Project Changes

- **Eliminate navigation connections between Lake Michigan and the Illinois River and Waterway using fill, and replace them with terminals or harbors for off-loading of ships and barges over levees or barriers between the two watersheds.**

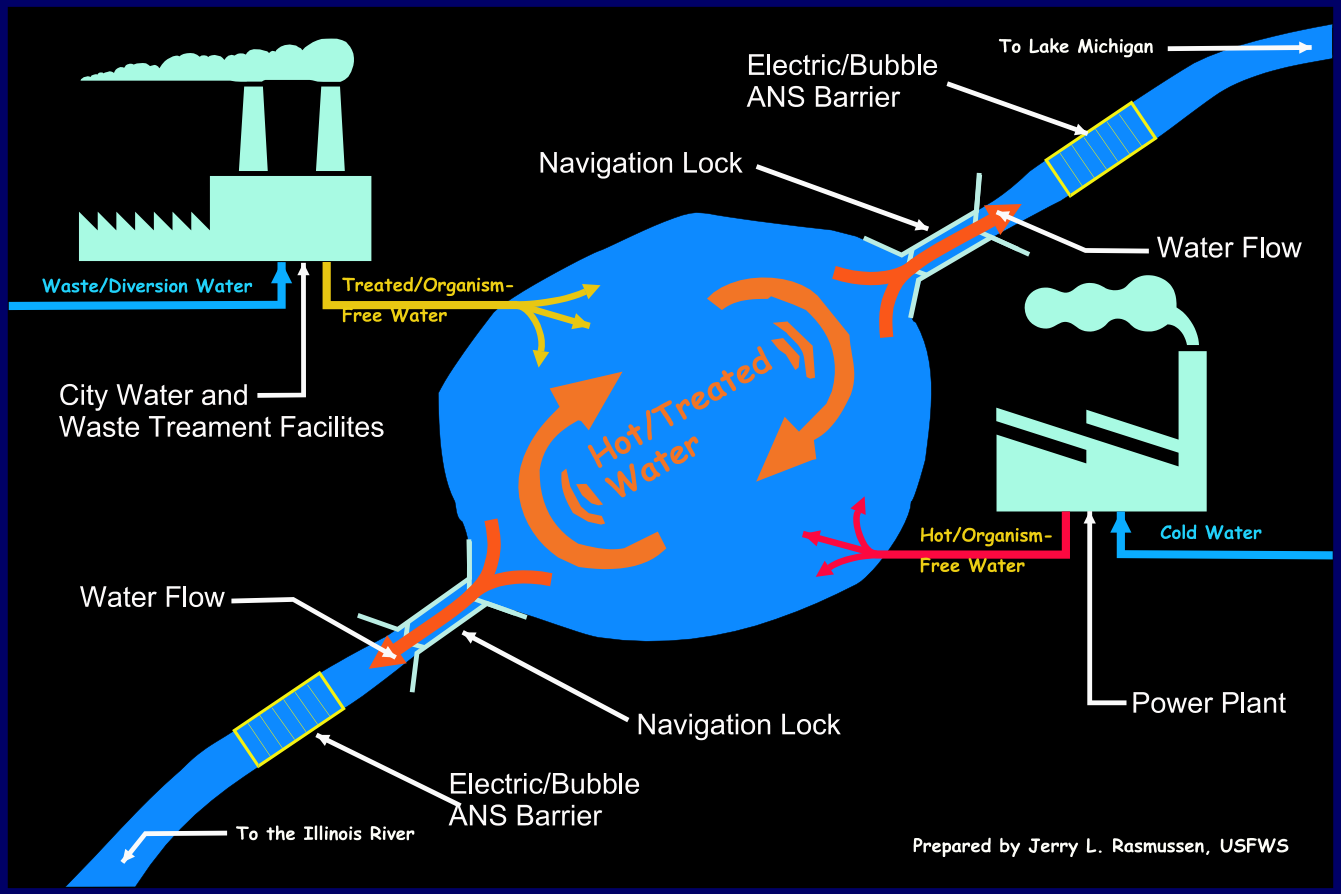
- **Temporarily close all navigation locks and retrofit them with devices which would prevent invasive species passage. Such devices might include electric, bubble, or chemical barriers to fish movements, use of heated power plant effluents or fish toxicants for each lockage to destroy any fish entering the locks.**

- **Close all locks to commercial traffic, as above, only allowing recreational traffic through smaller, more closely monitored and controlled locks using various physical and chemical treatments.**



Hydraulic Separation

- **Challenge the engineers to "replumb" or hydraulically separate the Great Lakes and Mississippi River basin watersheds, essentially reversing or amending the engineering feats of the past (e.g. not unlike the re-engineering project on the Kissimmee River in Florida).**



Conclusion

- **No silver bullet exists!**
- **A combination of alternatives are needed to stop upstream and downstream movements of adult fish, versus downstream drift of microscopic organisms, versus international and interstate transport of nuisance species.**
- **Cooperation is needed between upstream and downstream entities, interstate and international jurisdictions, environmental and economic concerns, as well as public and private interests is needed.**
- **Invasion of nuisance species is everybody's business!**

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