

Summary of current strategies being used to monitor and eradicate Asian carp

- ***Use of electric barrier that physically blocks fish movement*** – This has been the longest-running method used to stop the spread of Asian Carp from the Illinois River into the Great Lakes. Three barriers have now been constructed in this area. The barriers stop fish movement by exposing fish to unpleasant electric stimuli. An electric barrier is considered the best tool to stop large-scale movement of Asian carp from the Illinois River into Lake Michigan via the Chicago Area Waterway System. However, this technique may not be applicable in other waterways. The barrier stops the movement of all swimming fish, not just Asian carp, so it could adversely impact native fish. There are also potential human dangers with the barrier. In addition, flooding may provide a way for fish to move around the barrier. The barriers also can malfunction, require maintenance and aren't effective against certain types of Asian carp movement: via the ballast water of ships or bait buckets, for example.
- ***Application of poison to waterway*** – In cases where there are low-density populations of Asian carp in a waterway, poison is the most reliable way to eliminate the fish. The fish toxins that are used are Rotenone or Antimycin. But while poison is an effective way of stopping an aquatic invasion, there are some obvious drawbacks, most notably the impact on the population of other fish. There are also other issues such as costs, the availability of the poison, and regulatory restrictions.
- ***Electrofishing*** – This technique employs the use of electricity to stun fish so they can be caught or observed. Electrofishing is said to result in no permanent harm to the fish being stunned, so in that sense, it is a preferred technique when compared to the application of poison. However, there are limits to the use and efficacy of electrofishing: weather conditions, availability of electrofishing crew, the impact on the movement of vessels through the waterway and limited capacity for lab analysis. Electrofishing also only collects and eliminates fish from a particular range length.
- ***Netting*** – With this technique, nets are installed in the waterway to prevent fish from moving further upstream or downstream. They are then collected and observed. The drawbacks and strengths of this scientific technique are similar to those of electrofishing. For example, the netting can only be done in a specific part of the waterway.
- ***Commercial harvesting of Asian carp*** – The Illinois Department of Natural Resources has employed commercial fishermen to catch and remove Asian carp from the Illinois River, a part of the Mississippi River system with a high density of Asian carp. In 2010, crews removed more than 100,000 pounds of Asian carp along about a 30-mile stretch of the river. However, there are questions about whether the carp will simply repopulate over time. Also, these increased fishing operations can have a negative impact on commercial vessel traffic movement. There are also some other unanswered questions regarding this approach. For example, what is the market for the Asian carp caught by the commercial crews? Without a viable commercial market for the fish, the cost of this type of commercial harvesting becomes unsustainable. On the other hand, finding enough customers for Asian carp makes this an appealing approach to Asian carp

control. The state of Illinois has signed an agreement with a Chinese meat processing facility for the annual purchase of up to 50 million pounds of Illinois River Asian carp. The state is also developing an Asian Carp Training, Certification, Incentives and Market Development Program, while exploring the possibility of Asian carp being used as food in U.S.-sponsored humanitarian relief efforts. Along with human consumption, another potential commercial application is the use of the carcasses of Asian carp as fertilizer. Illinois' hope is that commercial harvesting of Asian carp will eventually be a revenue generator, with some of the proceeds going to invasive species prevention. These efforts are just getting started, so it is hard right now to gauge the long-term efficacy.

- **eDNA testing** – This is a new scientific tool that allows researchers to test for the presence of Asian carp in a waterway; eDNA can provide an early warning that carp may have entered the waterway and that an aggressive response is necessary. On the downside, it is unclear what a positive result means. For example, it may not mean the presence of live Asian carp in a waterway; the DNA may have come from dead Asian carp that entered the waterway via a barge or combined sewer outfalls.
- **Side-scan sonar** – With side-scan sonar, Asian carp are distinguished from other fish in the water through images of objects in the water. It is a way to detect Asian carp and decide which collection/eradication techniques to use.
- **Changing structure and management of locks** – Locks in the Chicago Area Waterway System have been closed intermittently to suppress the movement of Asian carp. New screens have also been installed on sluice gates. Only a permanent closure of locks, though, would be effective in preventing the spread of Asian carp.
- **Separating watersheds** – The Indiana Department of Natural Resources has installed mesh fencing to ensure Asian carp cannot pass between two drainage basins. These basins are generally not connected, but carp could have flowed between the basin under certain flooding conditions. This is an example of identifying potential ways for Asian carp to spread within a state or region, and then taking proactive measures. The Indiana program is known as the Wabash-Maumee Interim Watershed Separation. A permanent separation of the two watersheds is now being pursued.
- **Enforcement and outreach** – There are state and federal regulations in place that are designed to stop the movement of Asian carp (most notably, the federal Lacey Act). Improving enforcement of these regulations, as well as raising awareness, is one way to help stop the spread of Asian carp. For example, the fish stocks of bait shops can be screened for Asian carp. While this can be effective, it also takes a considerable amount of time and expertise. A simpler strategy is to raise awareness about the Asian carp problem by reaching out to bait shops, fish processors, fish markets, and retail food establishments. Another idea is to increase the personnel needed to better enforce the Lacey Act, which prohibits the importation and interstate transport of “injurious wildlife” such as the Asian carp.
- **Determining areas of waterway most conducive to Asian carp spawning** – By finding the habitats suitable for Asian carp spawning, researchers are better able to determine where to target their actions to control the spread of the invasive species.

Potential eradication/management strategies being researched and explored

- **Use of seismic technology to divert or eradicate Asian carp** – Research is being done on whether sound waves/barriers can be used to affect the behavior of Asian carp. It is too soon to say whether acoustic barriers will be effective enough for use. The existing techniques – poison, netting, electrofishing and barriers – have had little success in changing the size of the adult Asian carp population. The hope is that acoustic barriers would have more of an effect.
- **Develop “chemical attractants” associated with the food stimuli and sex pheromones of Asian carp** – Under this strategy, which is still being researched, Asian carp could be specifically targeted by developing a species-specific method of attraction. A specific bait could then be developed to lure and capture Asian carp in the waterway.
- **Toxicant screening** – Research is under way to find a toxicant more specific to controlling Asian carp. Right now, the poison being used (Rotenone) is general and affects all fish populations where it is applied.
- **Disrupt spawning behavior/decrease egg viability** -- The development of physical methods to disrupt Asian carp spawning activities, coupled with attractant pheromones, has the potential to limit the reproduction success of Asian carp. Research is under way now to see if a disruption of Asian carp’s spawning behavior is possible.
- **Reducing food sources for Asian carp through nutrient removal** -- Asian carp are filter feeders, so they reproduce prolifically in systems where there is an ample food supply supported by nutrient-rich conditions. Consequently, one long-term strategy to control the growth of the Asian carp population is to reduce the nutrients, fine particulate matter, and phytoplankton concentrations in a waterway.
- **Create toxic zones to kill fish migrating upstream** – The idea here is to use wastewater treatment plant effluent to create toxic zones. There are obvious concerns here about the impact of this approach on aquatic life and human health.

State-specific strategies and actions

Some of the approaches already being pursued by states include the following:

- banning the sale, transport, possession and introduction of Asian carp;
- prohibiting the harvest of bait fish from the Mississippi River and its tributaries to avoid spreading fish disease and having young Asian carp, which resemble popular bait species, from being taken to another water for use as bait;
- collecting water samples to test for Asian carp DNA; and

- improving outreach and education programs and employing the use of more watercraft inspectors (paid or volunteer).

One of the more recent state management plans was released in October 2010 by the state of Michigan. Here are some specific recommendations from the [Michigan Asian Carp Management Plan](#) – a) require certification of all commercial bait harvest license holders, b) increase inspection of baitfish distributors and hauling equipment, c) provide more public information on Asian carp threat, d) implement an eDNA surveillance strategy for Michigan’s waters, e) reach out to recreational and commercial fishers to improve monitoring, f) implement expanded fisheries surveys in waters where Asian carps have been detected, g) evaluate construction of temporary barriers, and h) encourage commercial and recreational harvesting of Asian carp.

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