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How Catfish and Algae Are Cleaning Up the Chicago River

The two are something like an odd couple in the fight to restore the river to health.

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Baby channel catfish at the first big release in October 2014 (Friends of the Chicago River)

In the world of angling, voracious channel catfish are considered an easy catch.

Thanks to the catfish's ability to "manage some degradation"—as Margaret Frisbie, executive director of the nonprofit Friends of the Chicago River, puts it—releasing the hardy fish into Chicago's river system is a simple way to show

the effects of water pollution and measure signs of progress.

“The channel catfish is the canary in the coal mine,” Frisbie says. “If they can survive, other things can happen.”

In a city like Chicago, which took a mandate from the U.S. Environmental Protection Agency in 2011 to start the cleanup of the notoriously polluted three-pronged branch of the Chicago River, that’s important.

A decade ago, Frisbie, who began working with the advocacy group in 2000, dreamed up and had built a 42-foot-long floating fish hotel: an island made of coconut fibers filled with native plants, demonstrating how downtown Chicago could offer a habitat where fish could easily thrive. Now that vision is becoming a more permanent reality.

Earlier this year, backed by a $300,000 grant, Frisbie’s group and the Illinois Department of Natural Resources completed a two-year-long project of releasing 195,000 baby channel catfish into the river system and creating 400 nesting cavities made of permeable concrete tubes, which mimic submerged logs.

“You should have seen it,” says Frisbie. “They came up from southern Illinois in a truck, and were shot out of pipes into the river.”

This year and last, a total of almost 200,000 catfish were released into the Chicago River. (Metropolitan Water Reclamation District)

This is the biggest fish release in the Chicago River's history, and Frisbie says it will take four or five years—the time it takes a catfish to mature—for advocates to see the long-term effects. Back in the 1970s, there were only an estimated five to seven species in the water (channel catfish not among them), compared to more than 70 species today. That long-term gain in ecological health is what made the project possible. "It wasn't worth doing until we knew it would be successful. We've finally gotten the river to the point where we could do this," Frisbie notes.

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Although channel catfish are native to the region, until recently they have been in limited in numbers due to poor water quality and lack of habitat. Two of the biggest contributors to the river's degradation: phosphorus and nitrogen, which reach the river through, among other things, human waste, and cause algae to grow like mad.

Scientists actually refer to phosphorus and nitrogen as nutrients. Dale Robertson, a research hydrologist for the U.S. Geological Survey, describes it this way: "At first, the nutrients help the algae to grow overabundantly, and the fish can eat more. But then the algae becomes so much, then it dies and decomposes, taking the oxygen out of the water. It's like putting food into an aquarium—if you put too much in, you have problems."

Right now, Chicago is dealing with an aquatic buffet where the food is rotting.

Phosphorus is a mineral found in humans, animals, and plants. Although it is a pollutant and can cause algae blooms (the reason many states have banned it in dish detergent), it is also an essential element which helps repair tissue and build strong bones and teeth, and a non-renewable resource that can be recovered and reused.

Unlike other states in the Midwest, Illinois hasn't set limits on how much phosphorus can be allowed in rivers and streams. There are plenty of factors that contribute to Chicago's high phosphorus and nitrogen levels. The city is only starting to disinfect its treated sewage before dumping it back into the river. Another factor is combined sewer overflows. Although these have declined substantially in recent years, raw sewage is still regularly released into Chicago's river system.

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In anticipation of state regulation, the Metropolitan Water Reclamation District (MWRD) will open the world's largest phosphorus recovery plant in February. The district will add chemicals to sewage to make a fertilizer product it can sell.

It's also begun testing another method to help recover phosphorus. Surprisingly, the idea involves cultivating algae inside one of its plants. The algae eats the phosphorus while it's in wastewater. After being cultivated, the algae can be scraped off conveyor-like belts and sold for a profit.

"We already know algae recovers phosphorus and nitrogen from the wastewater, and when you don't want it to grow, it will grow and it becomes a nuisance," says Tom Kunetz, assistant director of engineering for MWRD. "But if we can control the growth of the algae ... it can become a benefit to us."

A six-month pilot that concluded earlier this month didn't yield enough algae to be commercially viable. However, in September, the district started a one-year study at its O'Brien plant using a revolving algal biofilm reactor (nicknamed RAB) that was developed at Iowa State University.

Vertical conveyor belts, about six feet tall and three feet wide, revolve in a continual loop, dropping into 1,200 gallons of wastewater and then climbing into the air as multiple types of algae grow on them.

The algae-growing conveyer belts of the RAB system (Metropolitan Water Reclamation District)

The algae scrapes off "like a sticky tomato paste," Kunetz says, adding that it can then be composted and used as a fertilizer or as organic waste to feed anaerobic digesters.

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If this method ends up being permanently deployed, Kunetz says it would help reduce phosphorus and nitrogen levels in Chicago's wastewater, and potentially in other cities', too.

That means catfish—among other species—will be able to breathe a little easier. Next summer, the state Department of Natural Resources will begin

conducting tests near the catfish nesting sites to see if the fish are eating and hatching babies.

In the meantime, Frisbie and her fellow river advocates will research other cities' approaches and discuss more ways Chicago might reduce its phosphorus levels.

"We have to take what other people have done and figure out the answer for our own water system," she says. "We are on a voyage of discovery at this point. We are at the very beginning."

About the Author

Dawn Reiss is a journalist based in Chicago. She has written for *Time*, *USA Today*, and the *Chicago Tribune*.

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