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Freshwater mussels are cleaning America's rivers one gallon at a time

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Unassuming freshwater mussels are emerging as environmental heroes. These humble mollusks serve as the “livers of our rivers,” filtering 10-20 gallons of water daily while removing harmful algae, nitrogen, phosphorus, E. coli, microplastics and even metals.

“They're really small little workhorses out there, filtering,” says Jess Jones, a restoration biologist with the U.S. Fish and Wildlife Service and co-director of the Freshwater Mollusk Conservation Center at Virginia Polytechnic and State University. When native species of freshwater mussels are found in a river, it means the water is in good shape, according to Jones, who calls mussels “natural indicators of a river's health.”

As they filter and clean water, they support entire ecosystems both in the water and on land, creating healthier fish populations and economies that benefit from

improved fishing and recreation.

Despite their ecological importance, these invertebrates face serious challenges. Of North America's 300-plus freshwater mussel species, 70 percent are threatened and more than two dozen are already extinct. Just as their presence indicates healthy water, their absence often signals environmental degradation.

The science of harnessing mussels for ecosystem services is relatively young, developing mainly since the mid-1990s when researchers began recognizing their water-purifying potential. Unlike their commercially valuable marine cousins, oysters, freshwater mussels received little scientific attention until recently.

“Imagine the positive effects thousands or even millions of mussels would have on the water quality of a stream,” says Nick Utrup, a fish and wildlife biologist at the Minnesota-Wisconsin Ecological Services Field Office.

In Washington, D.C., the Anacostia Watershed Society (AWS) is turning imagination into reality by propagating and restoring mussel populations specifically to clean the Anacostia River. After centuries of industrialization and pollution decimated local mussel communities, AWS is reintroducing them as part of a comprehensive cleanup strategy that includes wetlands remediation, tighter regulations and infrastructure improvements.

The stakes are high: The Anacostia meets the Potomac River before feeding into the Chesapeake Bay, the largest estuary in the U.S. A cleaner Anacostia means a healthier ecosystem throughout this vital watershed, where fresh water from more than a dozen rivers and tributaries mixes with salt water from the Atlantic Ocean.

Over six years, AWS has released more than 38,000 native mussels — Eastern Pondmussel, Eastern lampmussel, Alewife floater, Eastern floater and Eastern elliptio — throughout the watershed. The mussels arrive as half-inch juveniles from Virginia’s Harrison Lake National Fish Hatchery and grow in floating cages until they're ready for release.

Results are already promising. This spring, scientists found a pregnant Eastern pondmussel that had been propagated and tagged in 2019. “Even with all these decades and even centuries of negligence, we have mussels that are now reproducing,” says Jorge Bogantes Montero, who runs the AWS mussel project. “We're still learning. There are a lot of question marks related to mussel biology and conservation.”

Nearby, the Potomac Riverkeeper Network has launched the 50 Million Mussel Project in partnership with National Harbor, Oasis Marinas and the Maryland Department of Environment. A freshwater mussel nursery visible to the public sits adjacent to the National Harbor boardwalk, combining restoration with education.

“I'm envisioning baskets at marinas and places where people access the river, so people can learn about how these work and why they're important,” says Potomac Riverkeeper Dean Naujoks. The project gained momentum from a recent settlement with the city of Alexandria, Virginia, over oil discharges, securing 15,000 additional mussels by 2026. The first 4,000 were reintroduced to the river in October.

The Potomac, often called “the nation's river,’ was once home to millions of mussels before becoming so polluted that in 1969 President Lyndon B. Johnson called it “disgraceful.” Today’s restoration efforts mark a dramatic turnaround in the river’s environmental trajectory.

However, mussel restoration isn’t simple. Many rivers remain too polluted, and the mollusks aren’t a quick fix for environmental damage.

“They are not a panacea for pollution,” says Rich Cogen, executive director of the Ohio River Foundation. “We need to reduce pollution and then add them to rivers that are being cleaned up.”

Even in suitable waters, restoration requires careful scientific work. Biologists must identify native species and understand complex life cycles that often depend on specific fish hosts.

“You can't just throw a bunch of mussels in the water and hope for the best,” cautions Montero. “It's been a learning process.”

Lance Butler, a senior scientist at the Philadelphia Water Department, established his own hatchery for both mussels and host fish after beginning research in 2012. His work investigates filtering possibilities for the Delaware and Schuylkill Rivers as well as smaller tributaries and canals in the Philadelphia metro area.

“We don’t have cookbooks with recipes on how to do it,” Butler explains. “It's not simple, it’s not like building a treatment plant. You’re almost like a detective. … You do not want to introduce a weak species or something that might influence native populations and weaken their population. There’s a lot of difficult things to do when it comes to this type of technology, but it’s doable. It’s a lot of exciting science that we’re cutting here.”

Despite these challenges, interest in mussel restoration is growing worldwide, Montero says, pointing to work being done in the European Union and Asia.As Jones notes, “There’s a lot of opportunity to engage the public in this kind of work” as citizen scientists.

For Naujoks, the benefit is clear. “Our goal is eliminating sources of pollution and protecting public use and enjoyment of the river. By putting these mussels in, we’re meeting our mission statement. … Having these mussels is just a really, really important way to do that.”