'Forever chemicals' pervade drinking water sources on Cape Cod, study finds

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By **David Abel** Globe Staff, Updated March 8, 2021, 12:06 p.m.

The Mashpee River Reservation. DIANE BAIR

The primary source of drinking water for tens of thousands of people on Cape Cod has elevated levels of toxic chemicals, according to a new study.

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Scientists at Harvard University found that several watersheds on the upper Cape around Mashpee had 40 times more PFAS — known as "forever chemicals" because they never fully degrade — than new state rules allow. The compounds have been linked to cancer, low infant birth weights, and suppression of the immune system.

The findings, published Friday in the journal Environmental Science & Technology, raised new concerns about the safety of the region's drinking water and the fish consumed from the area's rivers and ponds. The results also suggested that the chemicals are far more prevalent than previously believed.

"The big picture message is that when you only look for the routine number of chemicals, you're really missing a lot of the PFAS that's actually there," said Bridger Ruyle, an environmental scientist at Harvard and lead author of the study. "Our findings have implications for exposure to PFAS in our drinking water, and our diets."

Between 2017 and 2019, the scientists tested six watersheds on the Cape — three of them downstream of known sources of PFAS at Joint Base Cape Codin Buzzards Bay and Barnstable County Fire/Rescue Training Academy in Barnstable. For years, both used a special foam to practice fighting fires. The foam has since been found to have very high levels of PFAS.

The research team collected samples from the Childs, Quashnet, Mill Creek, Marstons Mills, Mashpee, and Santuit watersheds. The sampling sites in the Childs and Quashnet were downstream from the military base. Mill Creek is downstream from the fire academy.

In the downstream watersheds, the scientists found about 400 parts per trillion of the six compounds that are regulated in Massachusetts. After years of research showed growing dangers from PFAS, state officials will soon require communities to take remedial action if the total concentration of six of the chemicals reaches 20 parts per trillion.

The standard testing methods used by the Environmental Protection Agency and state regulatory agencies test for 25 or fewer known chemicals, but the vast majority of PFAS compounds are created by private companies and regulatory agencies can't find what they don't know exist. There are now thousands of the chemicals.

Using a novel method of testing, the researchers detected an additional 400 parts per trillion of unregulated PFAS chemicals.

"We're essentially doing chemical forensics," said Elsie Sunderland, a professor of environmental chemistry at Harvard and senior author of the paper. "We're simply not testing for most PFAS compounds, so we have no idea what our total exposure is to these chemicals, and health data associated with such exposures are still lacking."

State environmental officials said they would review the findings.

"The Massachusetts Department of Environmental Protection … will continue to work closely with municipalities to test for and address PFAS contamination in water systems throughout the Commonwealth," said Katie Gronendyke, a spokeswoman for the state's Executive Office of Energy and Environmental Affairs.

Andy Marks, superintendent of the Mashpee Water District, said he already has taken two of seven pumping stations offline after previous findings of elevated levels of PFAS.

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The water district now has an expensive filtration system working at one of the remaining five stations.

But it's unclear how much PFAS is in the drinking water pumped to residents. The water district won't begin testing for PFAS until next month, when the new state regulations take effect. Even then, they'll only be required to text for the six compounds.

Asked whether he was concerned about the new findings, Marks said: "It's safe to say I'm concerned about everything related to PFAS."

He believes the water in Mashpee remains safe to drink. "If the DEP and EPA give us guidelines, and we follow them, then we have to believe the water is safe, or else I wouldn't be able to sleep at night," Marks said. "We know the PFAS is out there, and we're doing our best to take proactive actions to eliminate it."

Others were less confident.

Andrew Gottlieb, executive director of the Association to Preserve Cape Cod, said he wasn't surprised that the chemicals are more prevalent than previously thought. He expected that water districts across the Cape and elsewhere in the state will find more PFAS when they begin routine testing of their water next month.

"We're going to get bad news," he said. "We already do a really bad job as a society about how we limit exposure."

Gottlieb urged state and local officials to do more to protect drinking water. "We need to minimize how many of these chemicals are out in the environment, because we can't control them when they're released," he said.

Ruyle, the Harvard scientist, said it remains unclear where the PFAS is coming from beyond the firefighting foam. It could be flowing out of septic systems. It also could be coming from the air, with winds carrying the toxic compounds from incinerators and

landfills.

PFAS is also found in many consumer products, including oil-resistant pizza boxes, the non-stick coatings of pots and pans, and water-repellant clothing.

The EPA recently found it in the packaging of a controversial pesticide used to kill mosquitoes in Massachusetts, which has been sprayed on millions of acres from the air and ground to reduce the spread of Eastern equine encephalitis.

Sunderland's previous research found that even minute amounts of the chemicals can be harmful to human health. In a study of children who had been exposed to PFAS on the Faroe Islands in the North Atlantic Ocean, she found that children should not consume water with concentrations of the chemicals greater than 1 part per trillion.

"We know enough about PFAS to know that they share some damning and unifying characteristics, and even tiny amounts can be harmful to living creatures," said Anna Ruth Robuck, a research scientist who studies PFAS at the University of Rhode Island. "If history is any predictor, what we don't know can and will still harm us."

Environmental advocates urged the state to do more to help cities and towns cover the costs of testing and filtering systems. They also called on chemical companies to subsidize those costs.

As of December, 32 of 164 public water systems tested over the previous year had more PFAS in their drinking water than allowed, state officials said. Environmental officials said the state had set aside about $30 million for municipalities to address PFAS contamination.

Advocates also called for the state Legislature to pass a bill that would eliminate the chemicals from food packaging and a range of other consumer products. There are no such federal restrictions.

"We need to take decisive action and decide collectively that the few relative conveniences that PFAS products have to offer aren't worth the lasting effects to our

bodies, our children's bodies, and our land, air, and water," said Maureo Fernandez y Mora, associate state director of Clean Water Action, an advocacy group.

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