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Study uncovers previously unknown PFAS contaminants in Cape watersheds

Doug Fraser Cape Cod Times

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HYANNIS – A study released Friday by Harvard University researchers found that conventional testing for per- and polyfluoroalkyl substances (PFAS) found just a fraction of what was actually present in water tested at sampling sites in the Childs River and Quashnet River watersheds in Mashpee, and the Mill Creek watershed in Hyannis.

But the finding no one expected was an additional large amount of PFAS in these three watersheds that had previously gone undetected and was not from firefighting foams used nearby.

“The biggest point sources (for PFAS) were the firefighting foams, but that it only explained half the total amount was very surprising to us,” said Bridger Ruyle, a Ph.D. student in environmental science and engineering at Harvard University and the lead author of the paper, which was published in the journal “Environmental Science & Technology.”

“This has huge ramifications for not only our understanding of human exposure but also for how much PFAS is discharging into the ocean and accumulating in marine life,” Ruyle said.

The study was part of a multi-year effort by the Sources, Transport, Exposure and Effects of PFAS (STEEP) program led by the University of Rhode Island in partnership with Harvard and the Silent Spring Institute.

Because they are heat-resistant and repel oil and water, PFAS chemicals have been in use since the 1950’s in products such as nonstick pans, stain- and water-repellant fabrics, polishes, waxes, cleaning products, food containers and many more products. Some of these chemicals have been linked to cancer, immune suppression, diabetes, low birth rates and other conditions.

PFAS chemicals travel in groundwater and are thought of as “forever” chemicals because they don’t biodegrade and accumulate up the food chain. Barnstable and Falmouth have shut down some private and municipal wells contaminated by PFAS.

The Massachusetts Department of Environmental Protection identified 14 public water supplies where PFAS compounds were detected. They include four on the Cape: the Hyannis Water System, Mashpee Water District and two public water supplies in Mashpee at Lakeside Estates mobile home park and Sea Mist Resort.

“The risk on Cape Cod is elevated because of the nature of the geology and the risk to groundwater,” Ruyle said.

A 2019 study of 101 private wells in 12 Cape towns led by Laurel Schaidler of the Silent Spring Institute and URI’s Alyson McCann found 46% had at least one PFAS chemical. Three percent of the wells tested were over the state maximum level for drinking water.

While the military is picking up much of the tab in Falmouth, Barnstable spent \$20 million over the past six years to remove (PFAS) from its municipal drinking water supply, Daniel Santos, Barnstable Department of Public Works administrator, said.

Barnstable uses activated charcoal to bind the PFAS chemicals in its treatment plant. But the Environmental Protection Agency requires tests for two PFAS compounds and the state tests for six PFAS compounds under its drinking water standards.

“Some (PFAS chemicals) are more treatable with carbon than others,” Santos said. “We’ve been lucky that the ones we’ve found have been treatable, but others are not so.”

Still, there are thousands of different PFAS chemicals. Because it takes years to test each one, their level of harm is not known, said Ruyle.

The researchers from Harvard's John A. Paulson School of Engineering and Applied Sciences used a new testing methodology on three years of water samples from the six watersheds that involved looking at the most stable compounds, known as terminal PFAS and the less stable precursor PFAS compounds, which are transformed into terminal PFAS by natural processes such as the action of microbes and sunlight.

They tested in the Mashpee and Hyannis watersheds, which were impacted by PFAS compounds flowing in groundwater from firefighting foam used at Joint Base Cape Cod and the Barnstable Fire/Rescue Training Academy. Three other watersheds — the Marstons Mills River, and the Mashpee and Santuit rivers — did not have a major source of PFAS and were used as control sites.

Conventional testing can find and identify 50% of the PFAS compounds contained in the older firefighting foams that were discontinued in 2001 due to high levels of PFAS and PFOA (perfluorooctanoic acid). These tests only detect 1% of PFAS used in modern foams.

But the new testing methodology used by the Harvard researchers picked up all the PFAS compounds found in all firefighting foams. Researchers were surprised when they found an additional 37% to 77% more PFAS compounds by volume, that could not be traced back to the foams.

The total levels of PFAS detected in the three test sites were all above the maximum levels set by the state for drinking water, Ruyles said. PFAS was also found in the control site watersheds at relatively low levels. Ruyle said they were likely due to consumer products, mostly believed to be pharmaceuticals such as antidepressants entering groundwater through septic systems.

Ruyle said additional testing of the control watersheds was needed to find the source of the unidentified PFAS and to determine if they also exist in the control site watersheds.

The study was supported by the Superfund Research Program, Strategic Environmental Research and Development Program as well as the U.S. Geological Survey.

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