

PFAS in Fish & Shellfish on Cape Cod

Key Findings

- STEEP measured PFAS in 114 samples of fish and shellfish from Waquoit Bay, Moody Pond, and the Quashnet and Santuit Rivers. PFAS were detected in all samples.
- PFAS levels in fish and shellfish were highest in locations closer to Joint Base Cape Cod, including Moody Pond and the Upper Quashnet River. Lower levels were found in fish and shellfish from Waquoit Bay, Lower Quashnet River, and the Santuit River.
- Most fish samples exceeded the Massachusetts state fish consumption advisory for PFOS, one specific PFAS chemical, for people who consume fish at least once a week.
- In general, shellfish contained lower levels of PFAS than finfish, and fish filets contained lower levels than whole body fish.

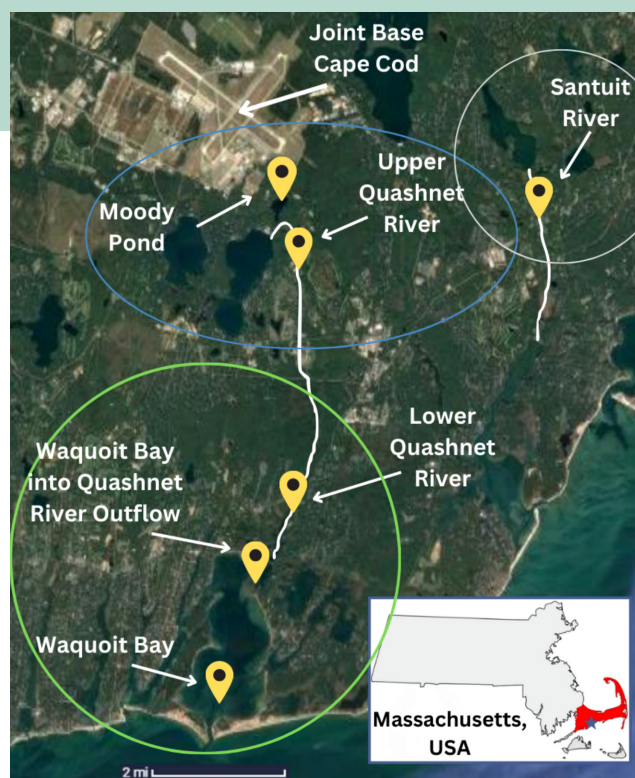
What are PFAS?

Known as “forever chemicals” because of their persistence in the environment, PFAS (per- and polyfluoroalkyl substances) are a broad family of chemicals found in consumer products such as fast-food packaging, nonstick cookware, rain jackets, stainproof fabrics, and cosmetics. Over 99% of people in the U.S. have PFAS in their blood. Exposures to PFAS have been linked to harmful health effects, including increased cholesterol, liver and immune system toxicity, and cancer.

PFAS have contaminated groundwater, surface water, and drinking water in many locations across the U.S. Common sources include firefighting foams often used at military bases and airports, industrial sites, and wastewater from sewage treatment plants and septic systems. On Cape Cod, PFAS have been detected in groundwater, ponds, and rivers, and the highest levels in groundwater have been found close to fire training areas at Joint Base Cape Cod and in Hyannis.

What did STEEP do?

Samples of 24 common fish and shellfish species were collected from popular fishing locations. The samples were analyzed to measure the levels of 37 individual PFAS chemicals from six locations (see map).



What did STEEP find?

PFAS levels varied by location. PFAS were detected in all samples with varying levels depending on species and location. PFAS concentrations were highest in samples gathered from waterways close to Joint Base Cape Cod. Fish samples in Moody Pond contained the highest levels of PFAS, and PFAS levels decreased as sampling moved downstream from Joint Base Cape Cod towards Waquoit Bay and to open water. Samples from the Santuit River, which is located in a different watershed, had the lowest levels of PFAS.

PFAS level varied by species. The species with the highest levels of PFAS were American eel, bluegill sunfish, redear sunfish, and white sucker. In general, shellfish had lower PFAS levels compared to finfish, with quahogs containing the lowest PFAS concentrations across locations. We did not see that larger fish had higher PFAS levels than smaller fish of the same species, nor did we see higher levels of PFAS in fish higher on the food chain. Fish filets (muscle) contained lower PFAS concentrations compared to whole body samples.

Fish consumption advisories

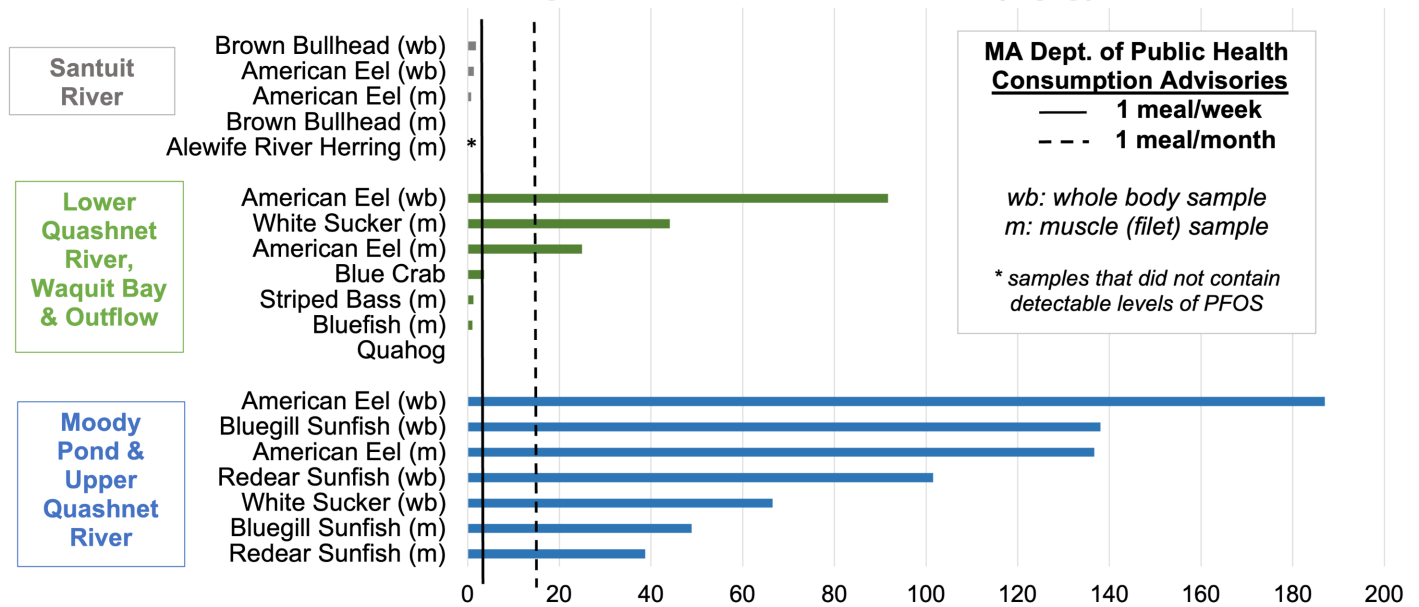
In 2021, the Massachusetts Department of Public Health released fish consumption advisories based on levels of PFOS, one PFAS chemical frequently found in the environment and in

people. Similar advisories have not been set by regulators for shellfish or other PFAS chemicals.

The graph below shows the average PFOS concentrations in the species sampled at each location, and the thresholds for the Massachusetts fish consumption advisories for the general population. All species sampled in Moody Pond and the Upper Quashnet River had PFOS concentrations above the state's one-meal-per-month consumption advisory.

Quahogs were the only species sampled from multiple locations with PFOS levels below the general population fish consumption guideline for one-meal-per-week consumption rates. Fish filet samples from striped bass and bluefish in the sites farther from Joint Base also fell below the guideline.

Average PFOS Concentrations (ng/g)



Average PFOS concentrations (in nanograms per gram) of fish and shellfish sampled in various locations.

What can you do to limit PFAS exposures from fish?

Based on these results, some people may wish to reduce their intake of PFAS. Some sensitive populations, such as young children, pregnant women, or women who may become pregnant, may be more at risk. Our initial findings suggest some ways that may reduce your exposure from fish and shellfish:

- Choose fishing locations near open water (Waquoit Bay or the Quashnet Outflow into Waquoit Bay) or that are further from Joint Base Cape Cod, like the Santuit River.
- Choose to eat filets rather than the whole body of a fish.
- Choose shellfish, especially quahogs, since they generally had lower PFAS levels than finfish.
- Limit or avoid consumption of American eels.
- Learn more about other ways to reduce PFAS exposures at uri.edu/steep



Harvard John A. Paulson School of Engineering and Applied Sciences



STEEP is funded under award number P42ES027706.



Learn more: uri.edu/steep

Thank you to officials from the Mashpee Wampanoag Tribe and the Town of Mashpee who helped facilitate sample collection.