



PFAS in the waters of Barnstable: Research and regulations over time



SILENT SPRING INSTITUTE
Researching the Environment and Women's Health

Laurel Schaidler, PhD
Senior Scientist
Silent Spring Institute

Barnstable Town Council | April 11, 2024

We are an independent, non-profit research organization dedicated to identifying the links between everyday chemicals and health, with a focus on women's health and breast cancer.

History

Founded by Massachusetts Breast Cancer Coalition in 1994.

Now a leading scientific research organization on environmental causes of breast cancer.



"A lab of our own"

Silent Spring Institute researchers have been studying endocrine disrupting compounds and other unregulated water contaminants on Cape Cod since the 1990s.



Septic systems



Ponds & estuaries



Groundwater



Drinking water

A close-up photograph of water being poured from a glass pitcher into a clear glass tumbler. The water is captured in motion, creating a dynamic stream with visible bubbles and ripples. The background is a soft, out-of-focus green, suggesting an outdoor setting. The glass sits on a dark wooden surface.

Tonight's presentation

- PFAS 101
- Timeline of Silent Spring Institute research on Cape Cod and drinking water regulations
- Resources for more information

PFAS 101





yesterday!

PUBLIC HEALTH

EPA puts limits on 'forever chemicals' in drinking water

APRIL 10, 2024 · 5:01 AM ET

HEARD ON MORNING EDITION



Pien Huang



EPA is limiting PFAS chemicals in drinking water in the U.S.
Rogelio V. Solis/AP

The Environmental Protection Agency announced new drinking water standards Wednesday to limit exposure to a class of chemicals called PFAS.

Home // Local Coverage // Health

In 13 state parks, Mass. officials issue advisories for fish consumption due to PFAS

NEWS

Lawmakers hope to 'turn off tap' of PFAS forever chemicals in Mass.

Updated: Jun. 22, 2023, 5:12 a.m. | Published: Jun. 22, 2023, 5:01 a.m.

When organic is toxic: How a composting facility likely spread massive amounts of 'forever chemicals' across one town in Massachusetts

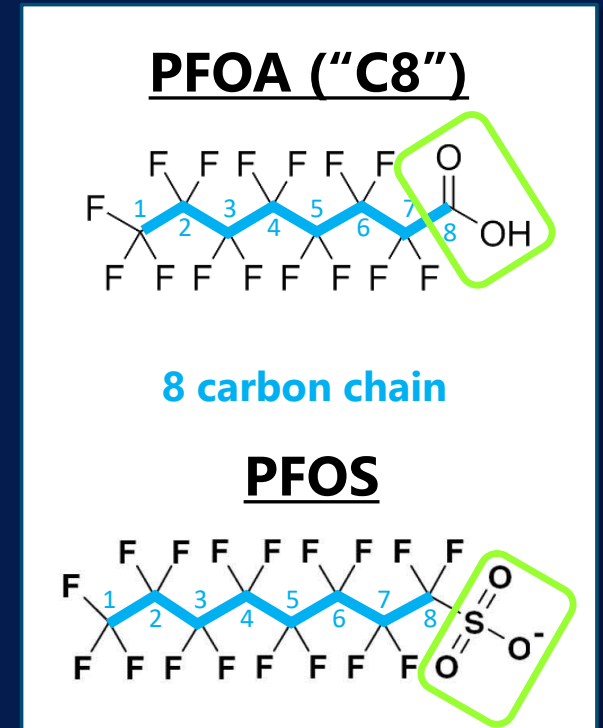
By [David Abel](#) Globe Staff, Updated July 6, 2022, 6:44 p.m.



PFAS 101

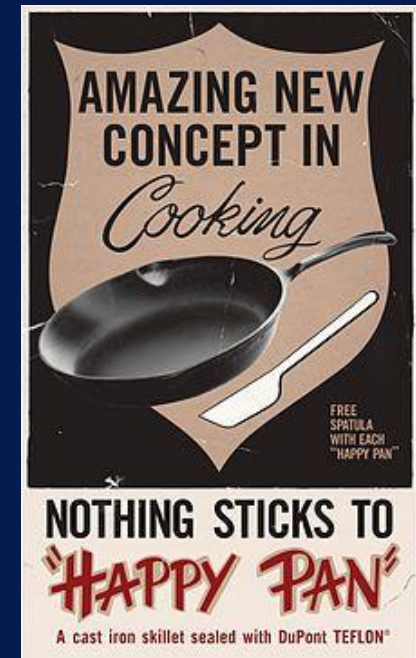
Per- and polyfluoroalkyl substances

- Class of over 14,000 compounds
- “Forever chemicals” - resist degradation
- Some accumulate for years in our bodies
- Mobile in environment
- Used in consumer products since 1950s
- Emerged as common drinking water pollutants around 2010-2015



PFAS are used in many everyday products

- Carpets & upholstery
- Waterproof apparel
- Non-stick cookware
- Waxes (floor, skis)
- Grease-proof food packaging
- Cosmetics
- Dental floss
- Paints



PFAS exposures are widespread



➤ **PFAS found in blood of over 99% of US residents (CDC)**



➤ **Some PFAS are long-lived in the human body**

- Long-chain PFAS: years
- Some newer PFAS: weeks to months
- Many PFAS: not yet studied



➤ **Who has higher levels?**

- Workers (PFAS-related industries, firefighters)
- Older people typically have higher levels than younger people
- Men typically have higher levels than women

Exposures to PFAS have been associated with many harmful health effects

- Increased cholesterol & risk of obesity
- Immune system suppression, including suppressed vaccine response
- Changes in thyroid hormone levels
- Reproductive effects (preeclampsia, decreased fertility)
- Developmental effects (decreases in birth weight, changes in bone density)
- Impaired mammary gland development
- Cancer (kidney, testicular, prostate)

Silent Spring Institute studies

CNN **CNN** @CNN **2017** Follow

Researchers found fluorinated chemicals in one-third of the fast food packaging they tested, according to a report [cnn.it/2jWU6Rw](https://www.cnn.com/2017/01/09/health/fluorinated-chemicals-fast-food/index.html)




NATIONAL GEOGRAPHIC **2019**

SCIENCE

Fast food increases exposure to a 'forever chemical' called PFAS

Used in fast food packaging, the long-lasting chemicals can seep into food—and build up in our bodies.



NATION **USA TODAY**

Oral-B Glide floss tied to potentially toxic PFAS chemicals, study suggests

Ryan W. Miller USA TODAY

Published 8:25 p.m. ET Jan. 9, 2019 | Updated 7:15 p.m. ET Jan. 10, 2019

2019



The Guardian

'Forever chemicals' found in nearly 60% of children's 'waterproof' or 'stain-resistant' textiles

A study found PFAS substances in clothing, pillow protectors, bedding and furniture, some labeled 'environmentally friendly'



Toxic PFAS chemicals, which have been linked to cancer and a range of other health problems, have been found in children's products such as bedding. Photograph: Colorblind Images LLC/Getty Images

2022

Thousands of known and suspected contamination sites across the U.S.



PFAS-REACH
PFAS Research, Education,
and Action for Community Health



PFAS Project Lab
Northeastern University

PFAS Exchange PFAS Project Lab

PFAS Sites and Community Resources
An interactive mapping project from the PFAS-REACH team

How to use this map:

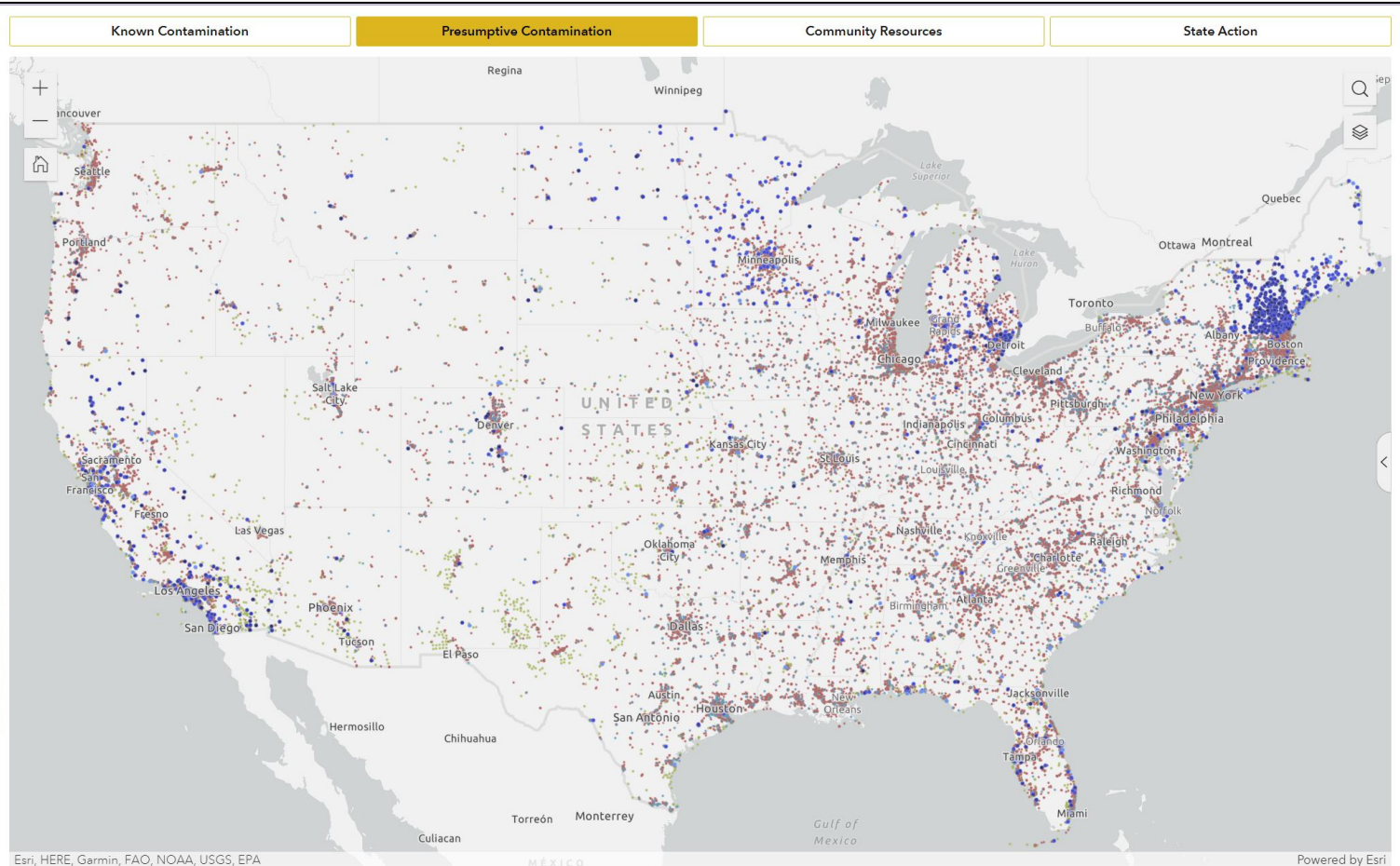
- Click on a site to learn more about it.
- Click the layers button in the top right of the map to display the "Known Contamination" sites or Tribal Lands boundaries.
- To collapse or expand the legend, click the arrow on the right side of the map.
- Choose one of the buttons below to learn more about the layers shown on this map.

Details: The Presumptive Contamination map includes sites that are often sources of contamination, but where testing has not confirmed the presence of PFAS. Based on the "Presumptive PFAS Contamination" model we published in Environmental Science & Technology Letters, it includes:

- 1) fluorinated firefighting foam discharge sites,
 - (2) certain industrial facilities,
 - (3) sites related to PFAS-containing waste.
- Other suspected sources of contamination, such as airplane and railroad crash sites, hydraulic fracking sites, and sewage sludge land application sites were not included on the map due to a lack of available nationwide data.

Military Sites:	<input type="checkbox"/> MIRTA
	<input type="checkbox"/> FUDS
	<input type="checkbox"/> Major Airports
	<input type="checkbox"/> Industrial Facilities
	<input type="checkbox"/> Wastewater Treatment Plants

Our Partners:



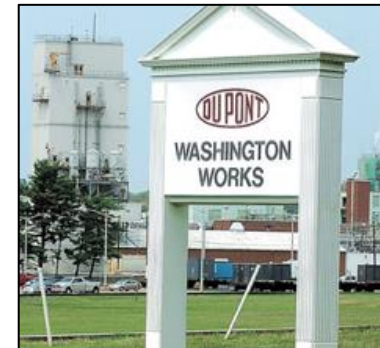
Esri, HERE, Garmin, FAO, NOAA, USGS, EPA

Powered by Esri

[About](#) [Contact Us](#) [PFAS Project](#) [PFAS Exchange](#)

How do PFAS get into water?

- Class B firefighting foams
- Fluoropolymer production facilities
- Other industries
- Wastewater treatment plants
- Septic systems
- Landfills
- Land-applied sludge



Sources of PFAS to Cape drinking water

- Highest levels found close to:
 - Joint Base Cape Cod
 - Barnstable County Fire and Rescue Training Academy
 - Barnstable Municipal Airport
- Lower levels found in many places around the Cape from other sources



Silent Spring Institute was first to find PFAS in public drinking water wells on Cape Cod starting in 2010



Emerging Contaminants in Cape Cod Drinking Water

Laurel Schaider, Ph.D.
Ruthann Rudel, M.S.
Sarah Dunagan, M.A.
Janet Ackerman
Laura Perovich
Julia Brody, Ph.D.

May 2010

2010 Silent Spring results on Cape Cod

20 public wells in 9 districts tested for PFOS and PFOA

PFOS detected above 1 ppt in 8 of 20 wells

- Up to 97 ppt (Hyannis)

PFOA detected above 10 ppt in 2 of 20 wells

- Up to 22 ppt (Hyannis)

Water Department	Results for 20 wells		
Barnstable FD	●	●	
Brewster	●	●	
Buzzards Bay	●	●	
Chatham	●	●	
C-O-MM	●	●	●
Cotuit	●	●	
Dennis	●	●	
Falmouth	●	●	
Hyannis	●	●	●

● Not detected ● Detected, below 20 ppt ● Detected, at or above 20 ppt

Silent Spring Institute was first to find PFAS in private wells on Cape Cod starting in 2011



2011



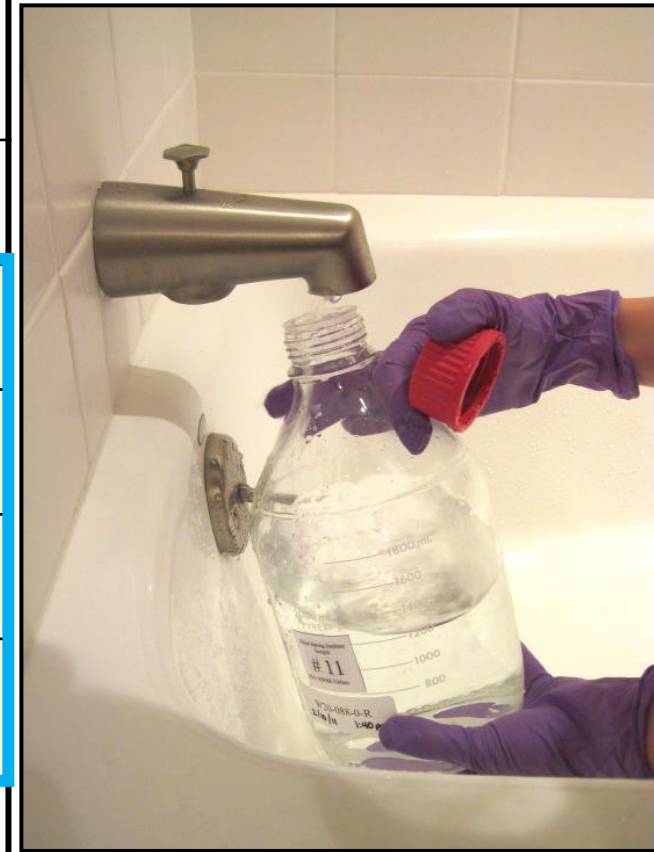
Emerging Contaminants in Cape Cod Private Drinking Water Wells

Laurel Schaider, Ph.D.
Janet Ackerman
Ruthann Rudel, M.S.
Sarah Dunagan, M.A.
Julia Brody, Ph.D.

November 2011

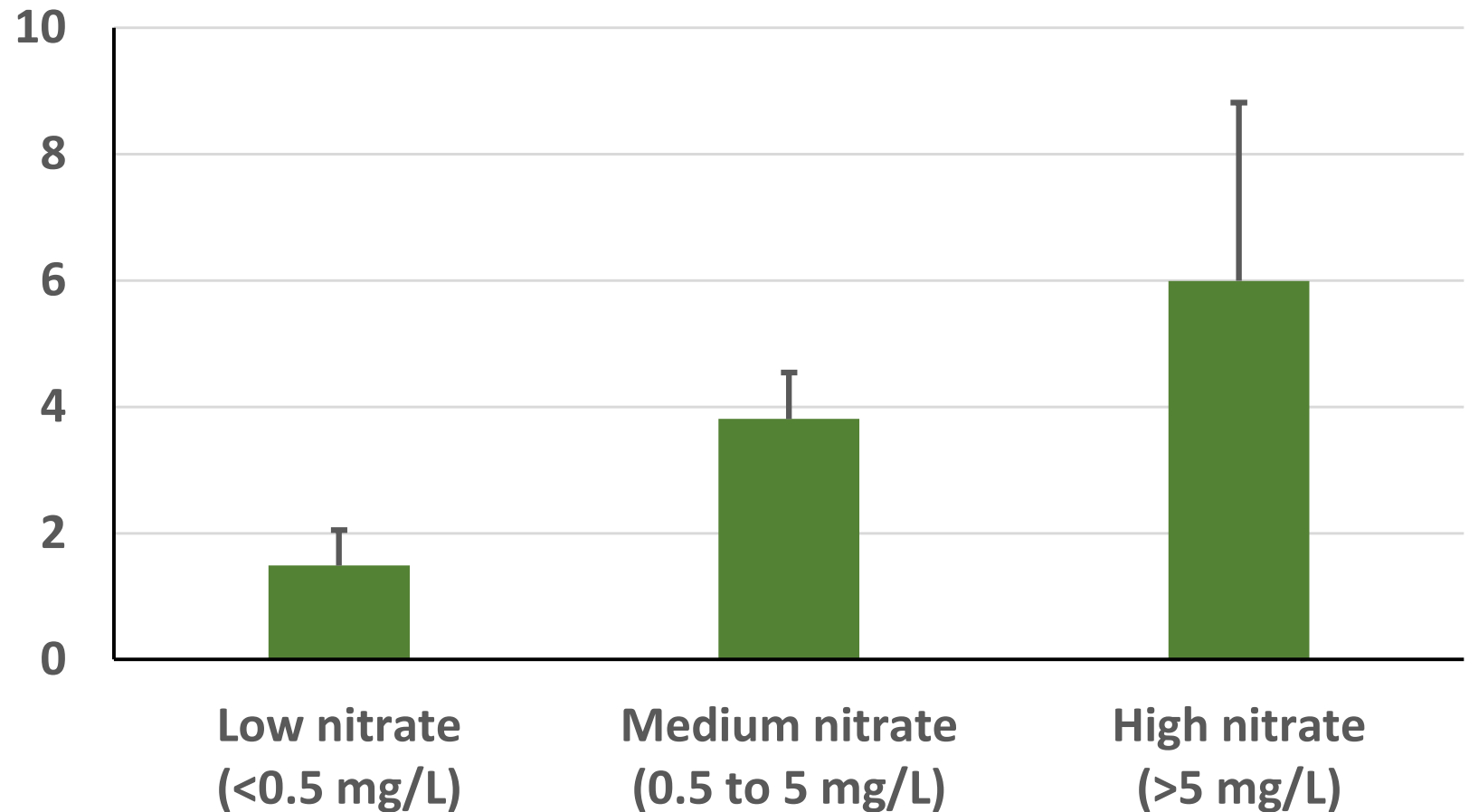
PFAS among most common emerging contaminants found in Cape private wells

Chemical	Category/uses	No. of wells (%)	Maximum concentration
acesulfame	Artificial sweetener	17 (85%)	5300 ng/L
PFHxS	Present in non-stick and stain-resistant coatings for textiles, paper, and other household products; fire-fighting foams and some industrial processes	11 (55%)	41 ng/L
PFBS		11 (55%)	23 ng/L
PFOS		11 (55%)	7 ng/L
PFHxA		10 (50%)	2 ng/L
sulfamethoxazole	Antibiotic	9 (45%)	60 ng/L



We also found higher PFAS in private wells with higher nitrate, indicative of septic system impact

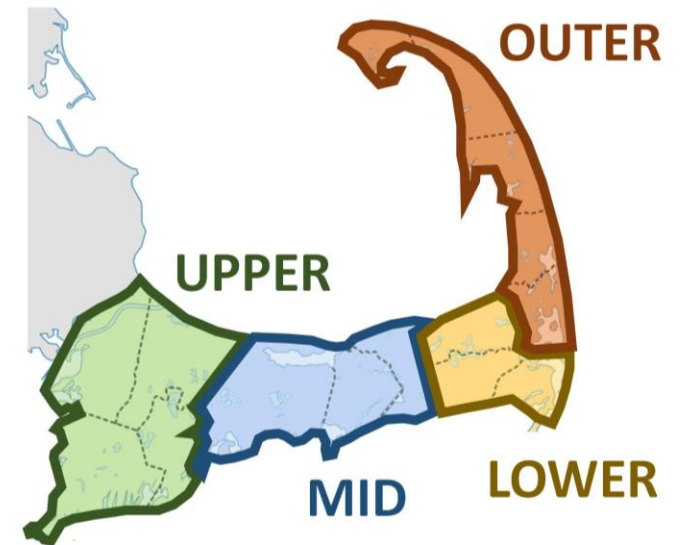
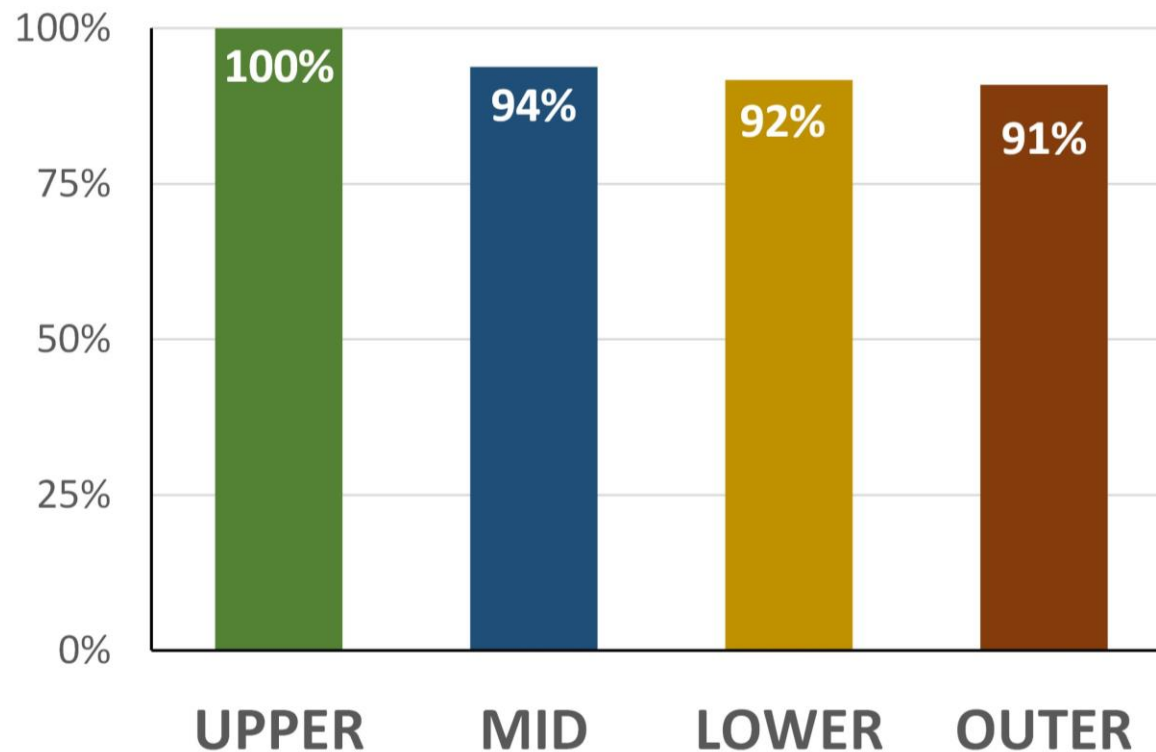
**PFAS6
concentration
parts per trillion
(ppt or ng/L)**



Sources, Transport, Exposure & Effects of PFASs
UNIVERSITY OF RHODE ISLAND SUPERFUND RESEARCH PROGRAM

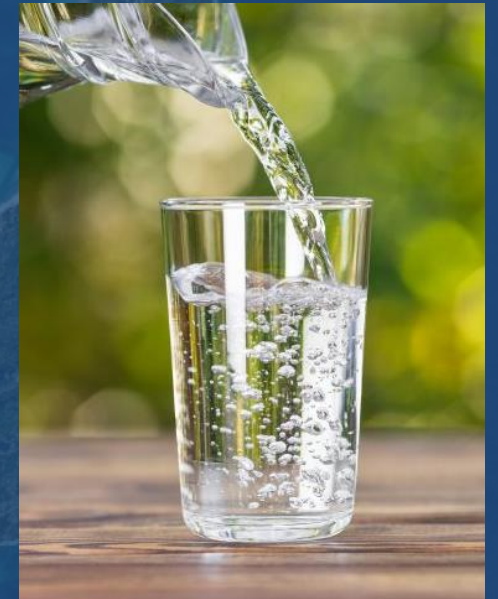
PFAS detections by section of Cape

Percent of wells with detectable PFAS



Sources, Transport, Exposure & Effects of PFASs
UNIVERSITY OF RHODE ISLAND SUPERFUND RESEARCH PROGRAM

In 2013-2015, EPA required PFAS testing by public water supplies as part of the Unregulated Contaminant Monitoring Rule (UCMR3)



UCMR3 testing on Cape Cod (2013–2015)

Testing mandated by EPA

- All large U.S. water supplies (over 10,000 customers) and subset of small water supplies
- Out of 170 Mass. water supplies tested, 5 had PFAS detections

15 Cape supplies included

- 2 had PFAS detections

Limitations: High detection limits

PFAS detected in:

Hyannis:

up to 430 ppt PFOS

Mashpee:

up to 33 ppt PFHxS

PFAS not detected in:

Bourne

Brewster

Chatham

C-O-MM

Dennis

Falmouth

Harwich

Orleans

Provincetown

N. Sagamore

Sandwich

Yarmouth

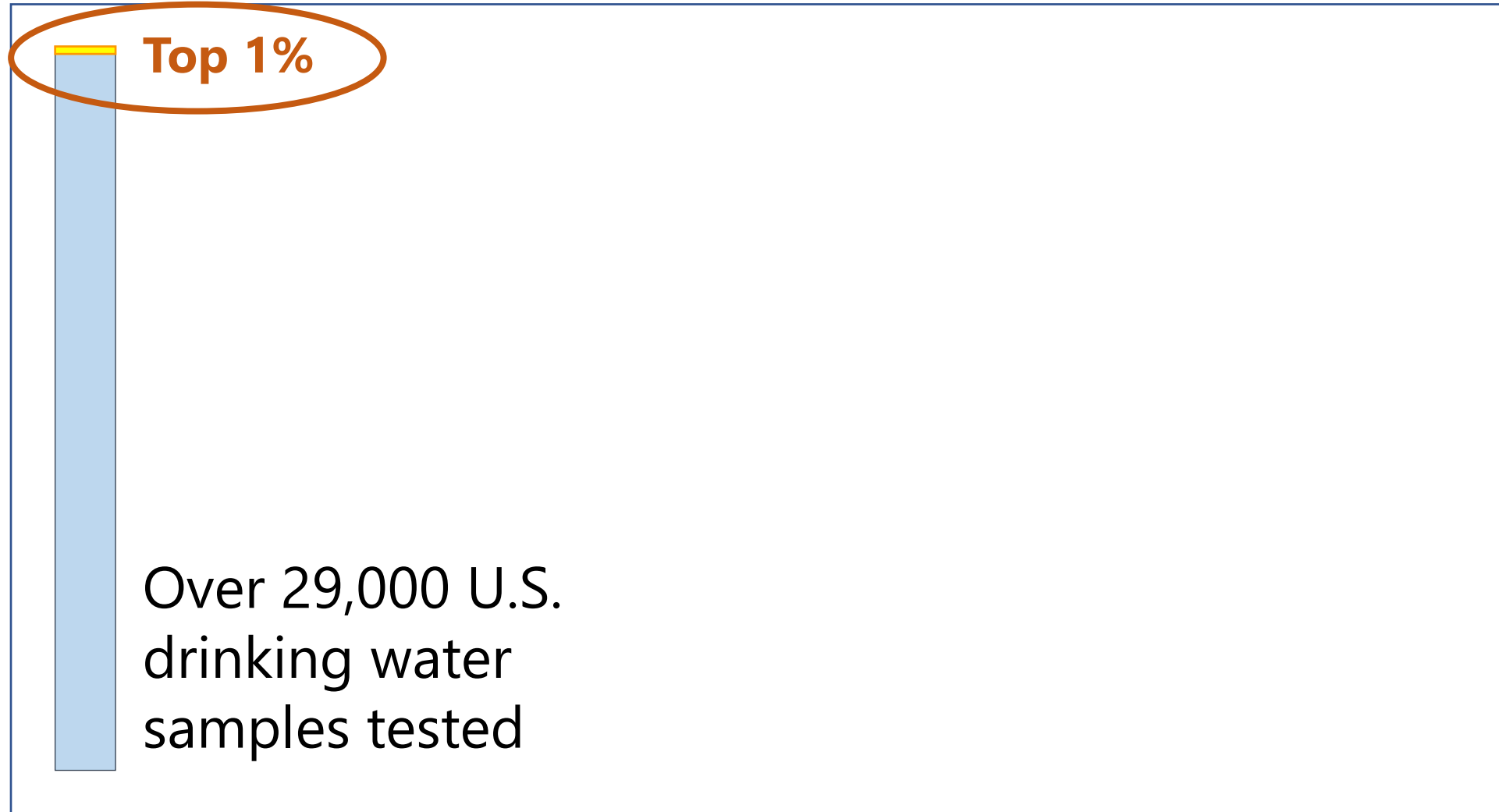
No testing in:

Barnstable FD

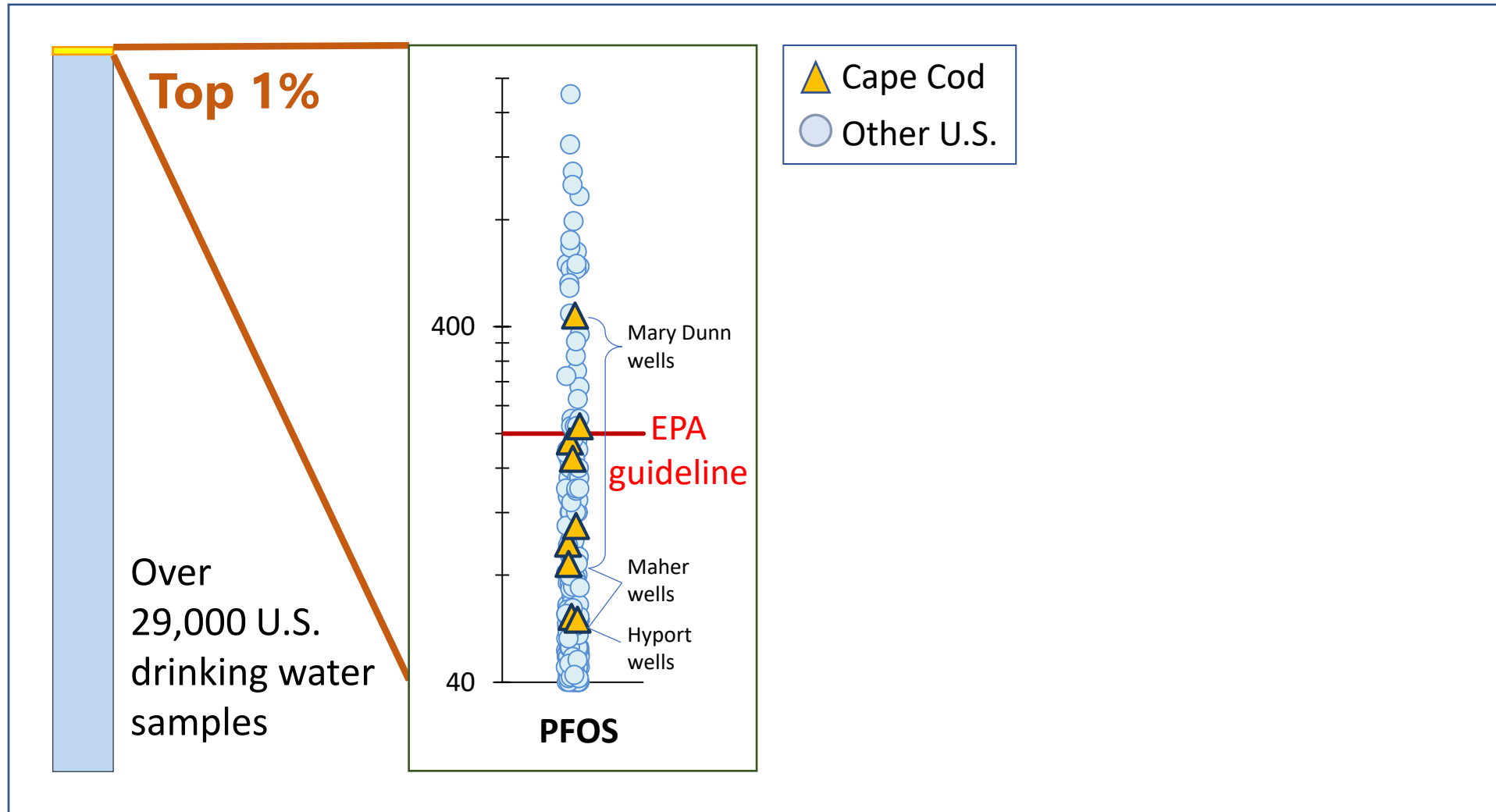
Buzzards Bay

Cotuit

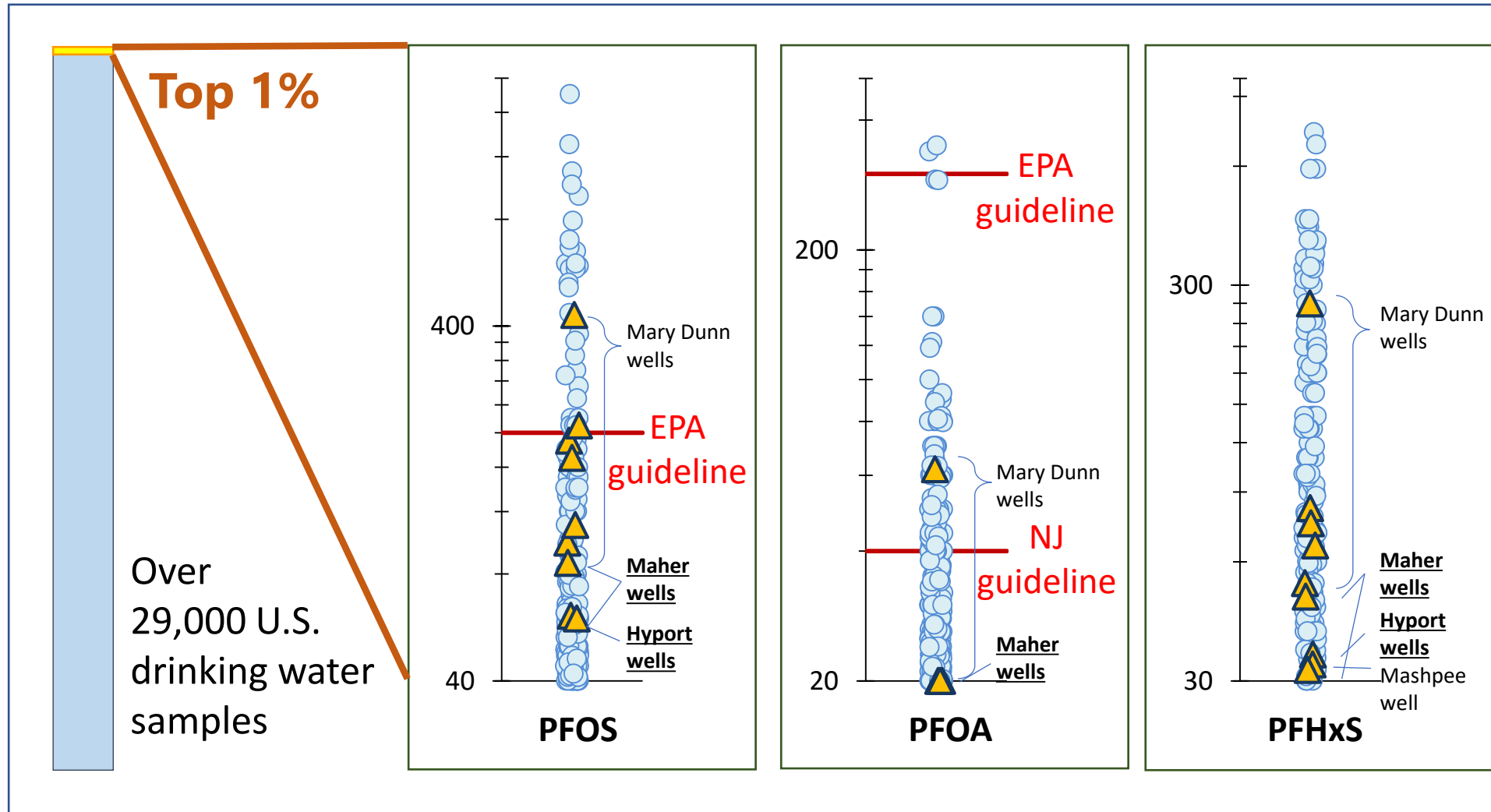
Hyannis was in top 1% of samples in the U.S. UCMR3 testing (2013–2015)



Hyannis was in top 1% of samples in UCMR3 testing (2013–2015)



Hyannis was in top 1% of samples in UCMR3 testing (2013–2015)



In 2016, EPA lowered drinking water guidelines for PFOS and PFOA.

Hyannis Water System issued temporary do-not-drink advisory.

2016

2024

CAPE COD TIMES

Hyannis residents warned about water quality

Haven Orecchio-Egresitz horecchio@capecodonline.com
Published 3:05 p.m. ET May 24, 2016 | Updated 3:15 p.m. ET May 24, 2016



In 2015, Hyannis Water System started filtering PFAS from some wells in Hyannis. All Hyannis wells are now filter to remove PFAS.



In 2019, Silent Spring Institute was awarded a grant to study PFAS health effects as part of a broader multi-site study funded by CDC

CAPE COD TIMES

NEWS

More Hyannis volunteers needed for PFAS health study. Learn more, join project at Nov. 16 info session



Heather McCarron
Cape Cod Times

Published 4:31 a.m. ET Nov. 15, 2022

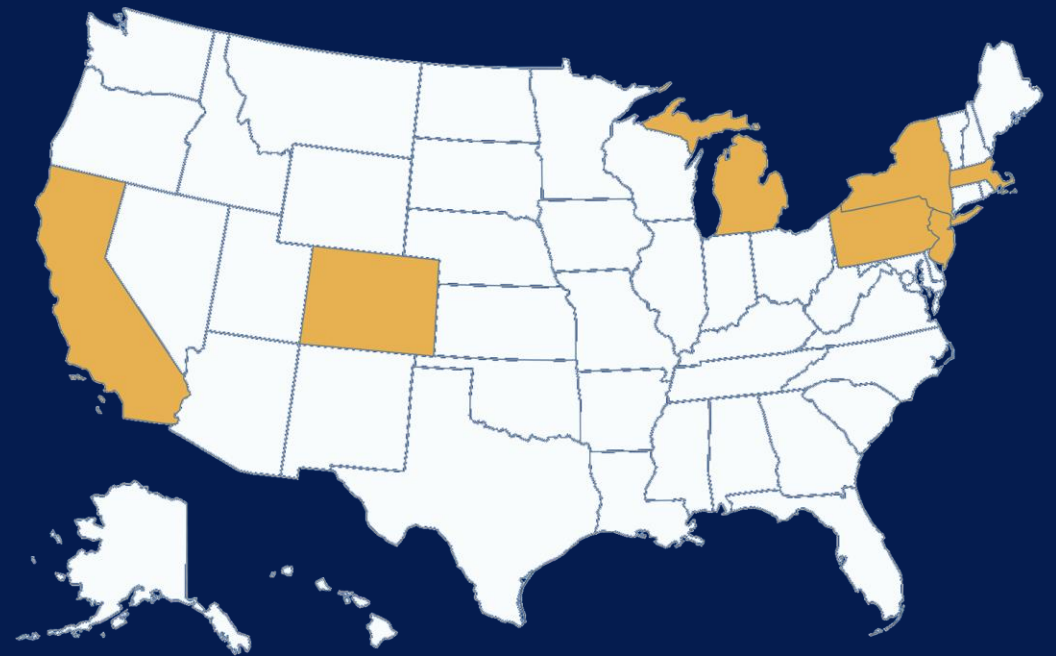


2019

CDC PFAS Multi-site Health Study

- Funded by **CDC's** Agency for Toxic Substances and Disease Registry (**ATSDR**)
- Goal: Improve our understanding of PFAS-related health effects
- Includes communities in 7 states with PFAS contamination of drinking water

Includes communities in 7 states





Massachusetts PFAS & Your Health Study in Hyannis and Ayer



Research partners

Silent Spring Institute (lead)
Harvard School of Public Health
Eastern Research Group

Local partners

Mass. Breast Cancer Coalition
People of Ayer Concerned about
the Environment (PACE)



MA PFAS & Your Health Study timeline

- Sept. 2019:** Silent Spring awarded grant from CDC/ATSDR
- Sept. 2021:** CDC/ATSDR receives approval for study protocols
- Nov. 2021:** Launch of recruitment in Hyannis
- Nov. 2022:** Launch of recruitment in Ayer
- Sept. 2023:** End of data collection across all sites



Massachusetts PFAS & Your Health Study
in Hyannis and Ayer

Help us learn how PFAS in drinking water can affect the health of children and adults!

Learn more and sign up:
bit.ly/ma-pfas-info

SPOTS AVAILABLE SPRING & SUMMER!

Participants will receive:

- Results from PFAS blood tests and other lab results
- Gift cards: Up to \$50 for adults and up to \$75 for children





Massachusetts PFAS & Your Health Study in Hyannis and Ayer

- **Study enrollment:**
Adults and children (ages 4-17)
- **Study components:**
 1. Blood draw and clinical visit
 2. Questionnaire
 3. Neurobehavioral tests (children only)
- **Data collection ended 9/30/23**



Study enrollment in Hyannis and Ayer

	TOTAL		HYANNIS		AYER	
	<u>18+</u>	<u>4-17</u>	<u>18+</u>	<u>4-17</u>	<u>18+</u>	<u>4-17</u>
Number of adults and children screened	972	156	592	77	380	79
Number of completed blood draws and questionnaires	676	89	385	41	291	48



In 2020, Massachusetts set a drinking water standard for the total amount of 6 PFAS chemicals ("PFAS6")



Massachusetts PFAS Drinking Water Standard (MCL)

Information on MassDEP's efforts to establish a drinking water standard for Per- and Polyfluoroalkyl Substances (PFAS).

Massachusetts PFAS Standard for Public Drinking Water Supplies

On October 2, 2020, MassDEP published its public drinking water standard or Massachusetts Maximum Contaminant Level (MMCL) of 20 nanograms per liter (ng/L), or parts per trillion (ppt) for a group of six Per- and Polyfluoroalkyl Substances (PFAS).



2020

Massachusetts Standard

MCL = Maximum Contaminant Level

- Adopted October 2020
- Among the strictest regulations in the U.S.
- 20 parts per trillion for “**PFAS6**”

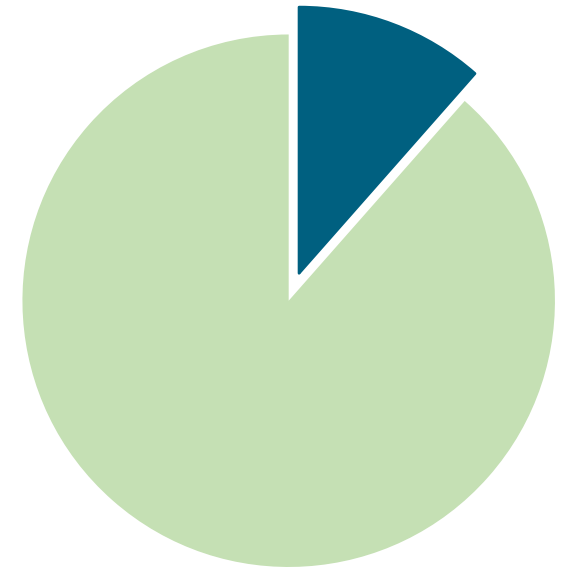
PFAS6: total amount of 6 common PFAS

PFOS, PFOA, PFHpA, PFNA, PFDA, PFHxS

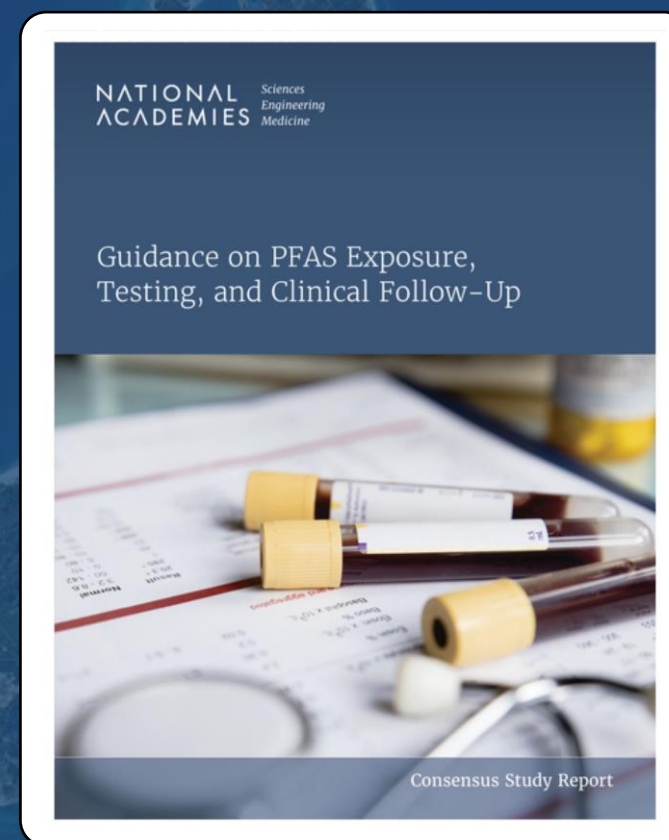
PFAS have been found in many MA public water supplies

- 1,418 public water supplies must test for PFAS in MA
- 163 public water supplies exceeded PFAS6 standard at least once
 - Many are municipal water supplies
 - Some serve schools, condos, municipal buildings, and other institutions

11% of public water supplies have exceeded state standard



In 2022, the National Academies of Sciences, Engineering, and Medicine published a report on PFAS health effects and clinician guidance



2022

National Academies report (2022)

- “Clinicians should offer PFAS testing to patients likely to have a history of elevated exposure.”
- Recommends additional clinical screening based on PFAS blood levels

Guidance on PFAS Exposure, Testing, and Clinical Follow-Up

<https://nap.nationalacademies.org/resource/26156/interactive/>

Sum of 7 common PFAS (µg/L)	National Academies suggested patient follow-up
Less than 2 µg/L	Clinicians should provide usual standard of care
2 up to 20 µg/L	Within usual standard of care, clinicians should: <ul style="list-style-type: none">• Prioritize screening for dyslipidemia with a lipid panel (once between ages 9 and 11, once every 4-6 years over age 20)• Screen for hypertensive disorders of pregnancy at all prenatal visits• Screen for breast cancer based on clinical practice guidelines based on age and other risk factors
20 µg/L or higher	In addition to usual standard of care, clinicians should: <ul style="list-style-type: none">• Prioritize screening for dyslipidemia with a lipid panel (for patients over age 2)• At all well visits:<ul style="list-style-type: none">○ Conduct thyroid function testing (for patients over age 18)○ Assess for signs and symptoms of kidney cancer (for patients over age 45), including urinalysis○ Assess for signs and symptoms of testicular cancer and ulcerative colitis (for patients over age 15)

**EPA is currently
collecting data as part of
UCMR5 (2023-2025).**

**All large and some small
public water systems will
be testing for 29 PFAS.**

**EPA's new data could sharpen public
focus on PFAS**

Ambient levels of per- and polyfluoroalkyl substances should be reviewed and considered in the development of regulations, says construction and engineering firm CDM Smith.

The U.S. Environmental Protection Agency (EPA) has shared the first of 12 batches of per- and polyfluoroalkyl substances (PFAS) data collected as part of the Fifth Unregulated Contaminant Rule (UCMR 5).



Barnstable water system testing in UCMR5

	Rounds of testing complete	Regulated PFAS detected?	Unregulated PFAS detected?
Barnstable FD	2	<ul style="list-style-type: none"> • PFOS: 4.4, 4.9 • PFOA: 4.4 	<ul style="list-style-type: none"> • PFBS: 10.3, 18.2 • PFPeA: 4, 5.5 • PFHxA: 3.1, 4.1
C-O-MM	0	--	--
Cotuit	2	None detected	None detected
Hyannis	1	None detected	<ul style="list-style-type: none"> • PFBA: 17 • PFPeA: 4.3, 30 • PFHxA: 5.8

On April 10, 2024, the US EPA issued drinking water standards for 6 PFAS chemicals

wbur LOCAL COVERAGE

Home // Local Coverage // Environment

EPA sets first national limits on PFAS in drinking water

April 10, 2024 By [Barbara Moran](#)



Every municipal water system in the country must test for, and limit, the presence of five PFAS chemicals within five years, according to new guidelines set by the federal government. It's the first time these toxic chemicals have been regulated at the national level.

The Environmental Protection Agency (EPA) regulations limit the two most common PFAS chemicals — PFOA and PFOS — to four parts per trillion in drinking water, close to the lowest level at which the chemicals can be detected. The EPA also set a non-enforceable goal for these two compounds at zero, reflecting that "there is no level of exposure to these contaminants without risk of health impacts," according to a press release.

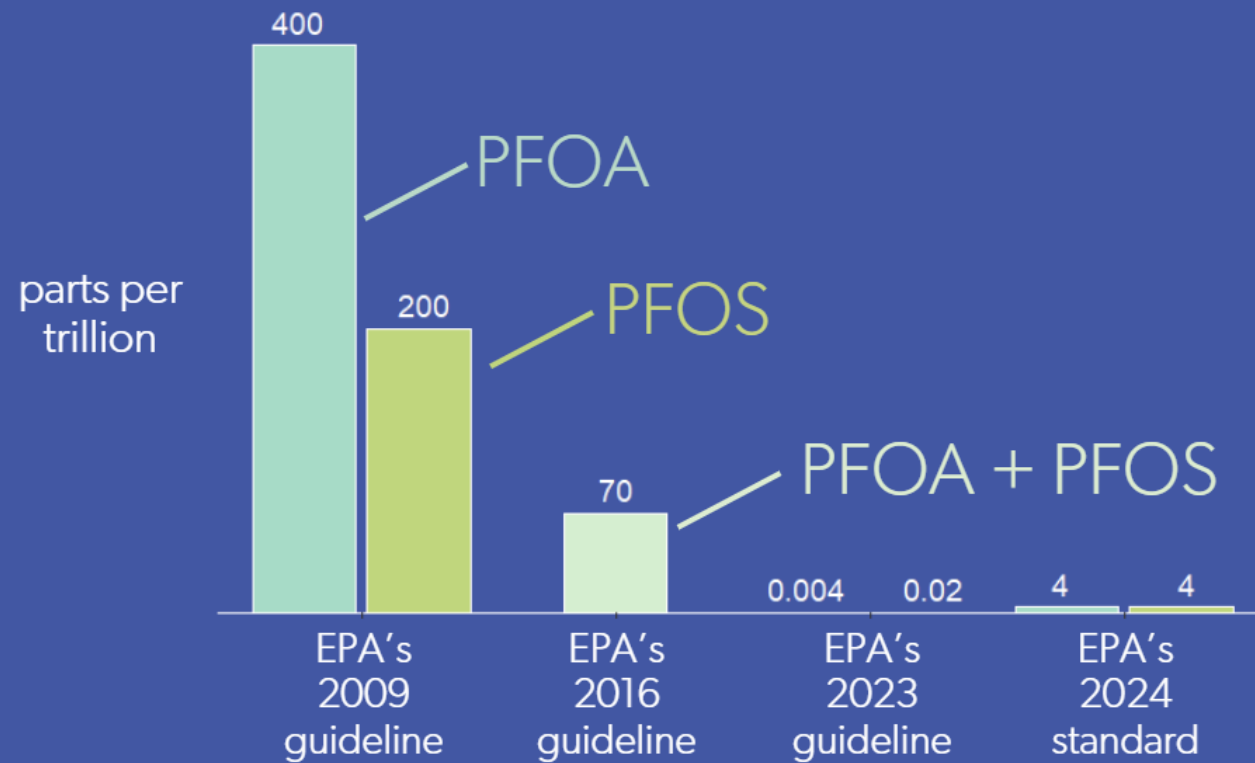


2024

EPA's new drinking water standards announced yesterday!

- **PFOA** and **PFOS**: 4 ppt (individually)
 - **PFNA**, **PFHxS**, and **GenX**: 10 ppt (individually)
 - **PFNA**, **PFHxS**, **GenX** and **PFBS**: Hazard index of 1.0
-
- 3 years to phase in testing, 2 more years to comply
 - Funding for public water supplies and private wells

Over the years, EPA has lowered its advisory levels for PFAS in drinking water, as growing evidence has shown toxic effects at lower levels of exposure.



Learn more! PFAS Exchange

- Fact sheets
- Community map
- Data interpretation tool
- Resources for clinicians

www.pfas-exchange.org



PFAS-REACH
PFAS Research, Education,
and Action for Community Health


How to Reduce Your Exposure to PFAS



PFAS (per- and polyfluoroalkyl substances) are a class of chemicals that companies add to consumer products to make them nonstick, waterproof, and stain-resistant. They are found in carpets and upholstery, waterproof apparel, non-stick cookware, grease-proof food packaging, and even dental floss. They are also used in firefighting foams for putting out fuel fires.


Unfortunately, studies have linked these chemicals with a range of health problems including disease, cancer, high cholesterol, obesity, an effects on the immune system. Luckily, there are simple steps you can take to reduce your exposure to PFAS and create a healthier environment for you and your loved ones.

- In your personal life:**
- ✓ Avoid stain-resistant carpets and upholstery, as well as stain-resistant treatments and waterproofing sprays.
 - ✓ Avoid products with the ingredient PTFE or other "fluoro" ingredients listed on the label.
 - ✓ Choose steel.
 - ✓ Filter carbons.
 - ✓ Eat from glass.
 - ✓ Avoid wrapping.
 - ✓ Look for uncoated.
- In your community:**
- ✓ Tell retailers and manufacturers you want products made without PFAS.
 - ✓ Urge your local water utility to test for PFAS.
 - ✓ Ask your state legislators to set up a statewide water and blood testing program.



PFAS-REACH
PFAS Research, Education,
and Action for Community Health

How Can PFAS Affect Your Health?



PFAS (per- and polyfluoroalkyl substances) are among the most ubiquitous synthetic chemicals in the world. Approximately 98 percent of Americans have PFAS in their bodies. People can be exposed to these chemicals in many different ways—through the water they drink, the products they use, the air they breathe, and the food they eat. During pregnancy, PFAS can pass from the mother to the fetus through the umbilical cord, and babies can be exposed through breast milk or formula made with contaminated water.

Although the science on health effects is still evolving, scientists are increasingly concerned about low-dose exposures, as they continue to find health effects at lower and lower levels. More research is needed on other PFAS chemicals, in particular ones that companies have developed to replace PFOA and PFOS. Because people are exposed to multiple PFAS from multiple sources, researchers are beginning to investigate the effects of mixtures of PFAS on human health.

Scientific studies have linked exposure to PFAS with:

Human studies

- High cholesterol
- Ulcerative colitis
- Cancer
- Prostate cancer
- Liver disease
- Thyroid disease
- Diabetes
- Asthma
- Depression
- Low birth weight

Animal studies

- Cancer
- Liver disease
- Diabetes
- Depression
- Immune system
- Cholesterol
- Low birth weight


Learn more: www.pfas-exchange.org

NIH/NIEHS PFAS National Initiative



PFAS-REACH
PFAS Research, Education,
and Action for Community Health

PFAS: A Word About Drinking Water Guidelines



Are PFAS regulated in drinking water?



PFAS (per- and polyfluoroalkyl substances) are currently not regulated under the Safe Drinking Water Act. This means there are no federal drinking water standards and public water supplies do not have to test or treat their water for PFAS under federal law. The U.S. Environmental Protection Agency (EPA) has set a non-enforceable health-based guideline level for PFOA and PFOS.

Why do guidelines vary?

Guideline levels are created when regulators, after reviewing the science, calculate a level of exposure below which health effects are not expected to occur. Regulators consider different types of evidence and factors when developing guideline levels:

- Studies linking exposure to PFAS with various health effects (for instance, effects on the immune system, liver, or mammary gland development).
- The impact on vulnerable populations such as infants or pregnant women.
- How much water people drink in a day.
- How much exposure likely comes from drinking water versus diet and consumer products.
- Molecular studies that show what happens to PFAS after the chemicals enter the body.

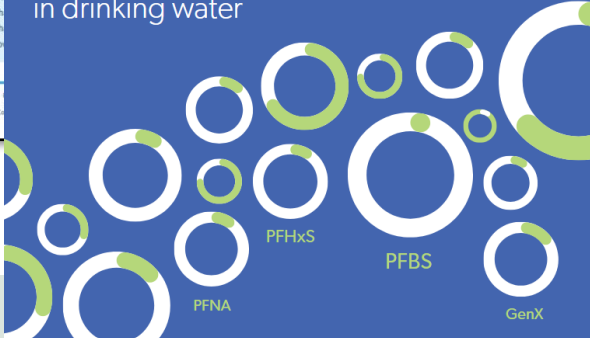
Although some variation is expected among the regulators believe this level of human health. Some states have developed their own guidelines, which are stricter than EPA's. The process of setting, not enforceable, but required to test or provide some protection.

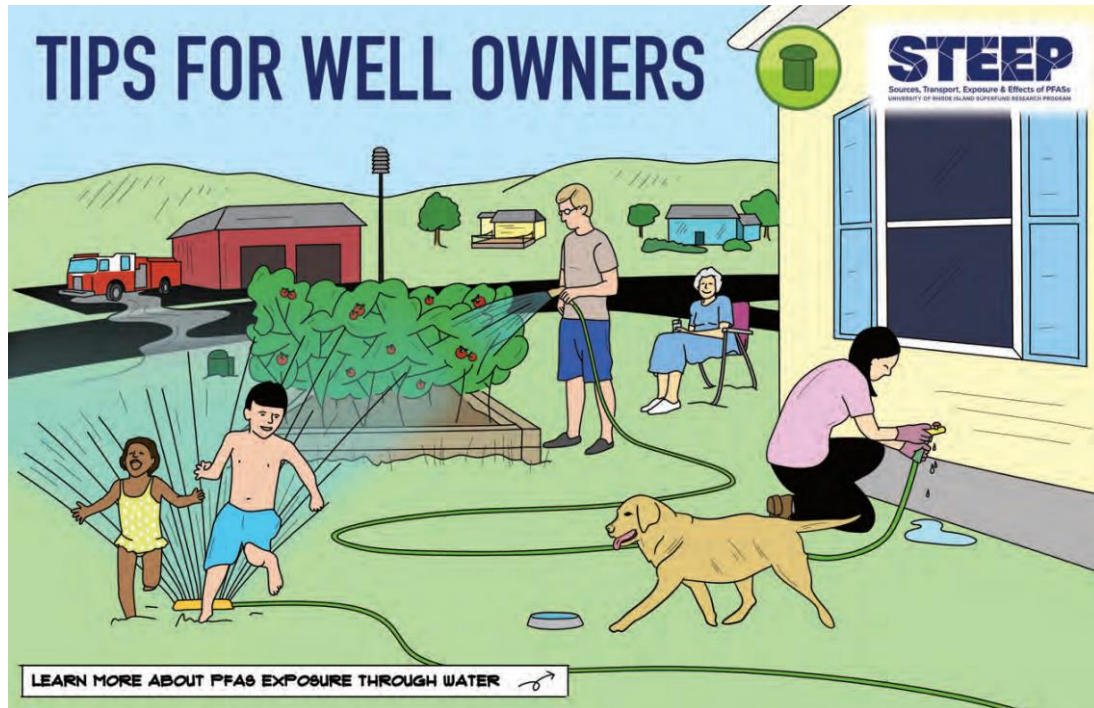
TOOL

Learn about the Hazard Index

EPA's tool for regulating PFAS in drinking water



PFNA
PFHxS
PFBS
GenX



URI STEEP's website has resources for a variety of audiences on PFAS, their health effects, and tips to minimize exposures



web.uri.edu/stEEP/resources



Resources

- PFAS Exchange: www.pfas-exchange.org
- Silent Spring Institute: www.silentspring.org
- MA Breast Cancer Coalition: <https://mbcc.org/pfas-faqs/>
- Northeastern University SSEHRI: www.pfasproject.com
- STEEP Superfund Research Program: web.uri.edu/stEEP
- Green Science Policy Institute: www.pfascentral.org
- National PFAS Contamination Coalition: www.pfasproject.net
- NC State University: <https://superfund.ncsu.edu/pfas-hub>



Thank you!

Laurel Schaider, PhD
Senior Scientist
Silent Spring Institute
schaider@silentspring.org

www.silentspring.org

