



PFAS 101

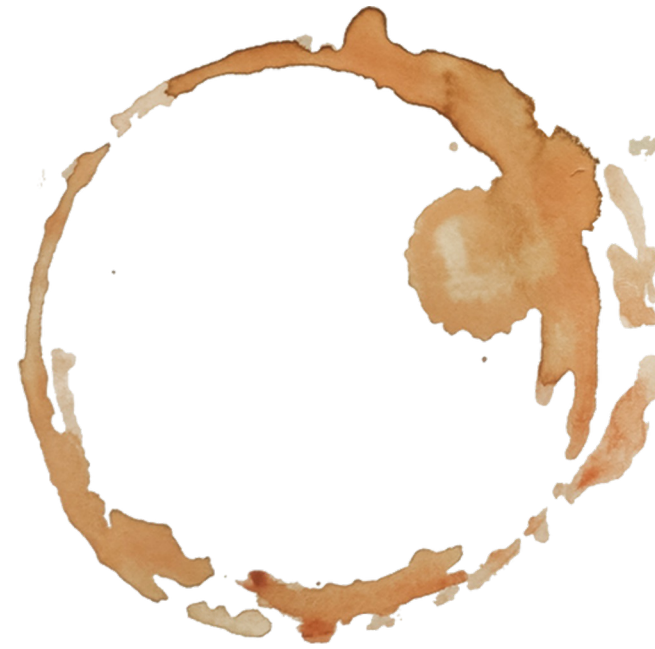
What every Massachusetts resident should know about "forever chemicals"



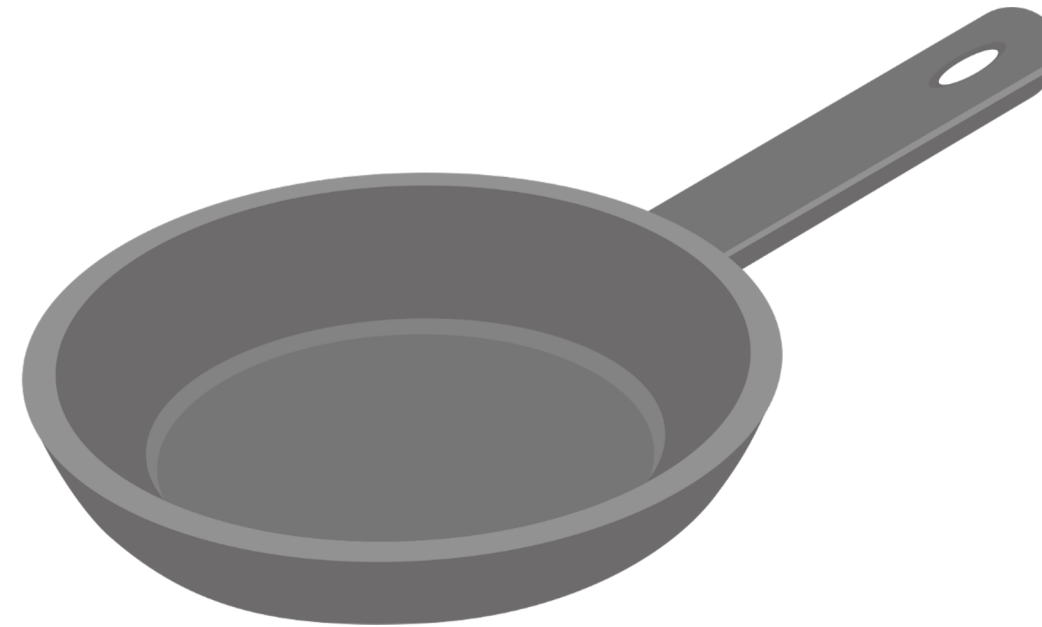
Confront polluters. Seed solutions.

Per- and polyfluoroalkyl substances (PFAS)

> 9,000
individual
chemicals



Stain resistant



Non-stick



Water proof

Agenda:

- PFAS: Where did they come from, what are they used in?
- Concerns about PFAS
- PFAS and drinking water
 - water
 - consumer products
- Government action



PFAS Origins

1946: Dupont: Perfluorooctanoic acid

(PFOA): used to make Teflon

1953: 3M: Perfluorooctane sulfonic acid

(PFOS): used to make Scotchgard

PFAS =

class of chemicals

PFOA and PFOS are individual

chemicals within the PFAS class



In consumer products

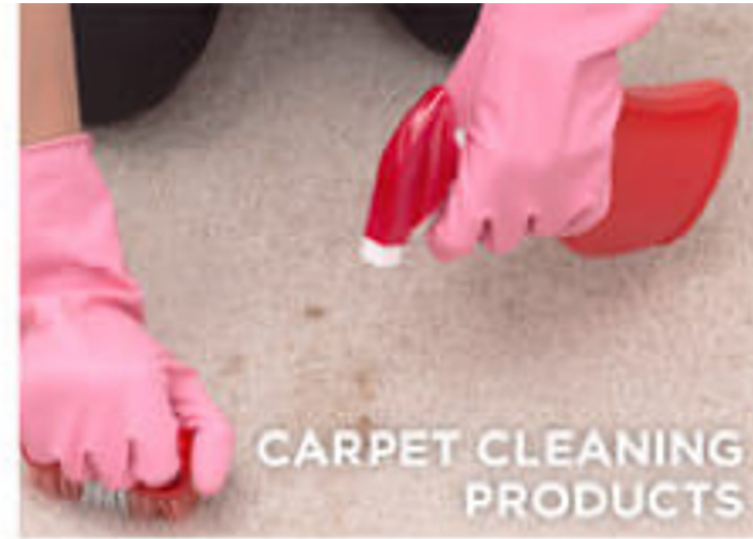
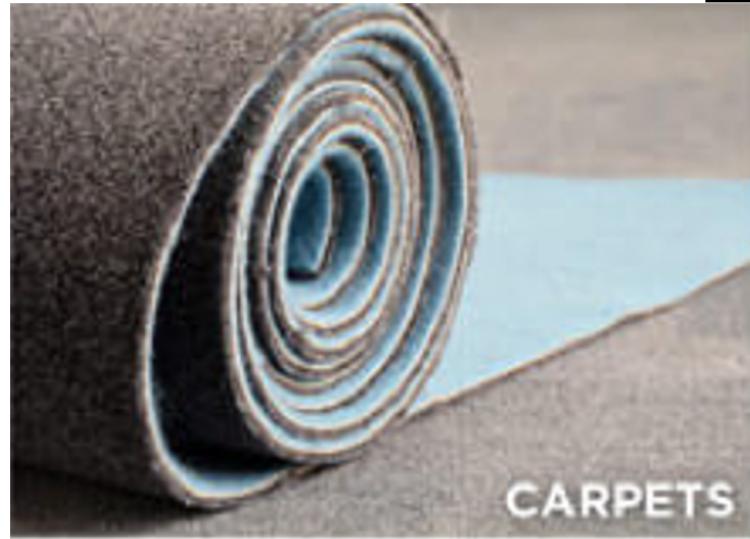


Image source: Green Science Policy Institute

& firefighting foam



Evidence of harm emerges



1946-2015 PFOA & PFOS

2006- New PFAS chemicals developed

2015- PFOA & PFOS no longer made in US but remain in environment.

Class approach

Each PFAS is slightly different but, like members of a family, they have common characteristics.

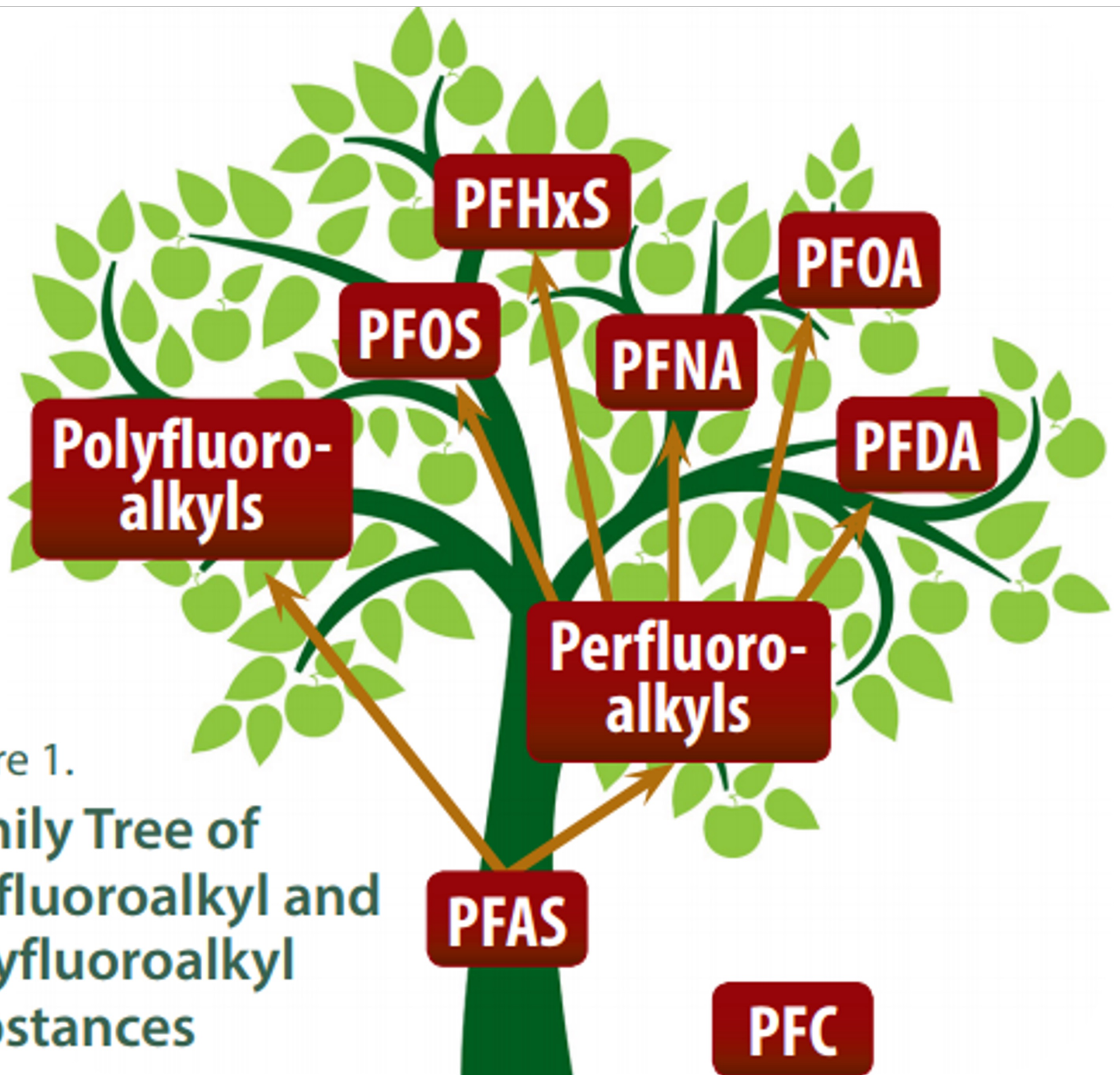


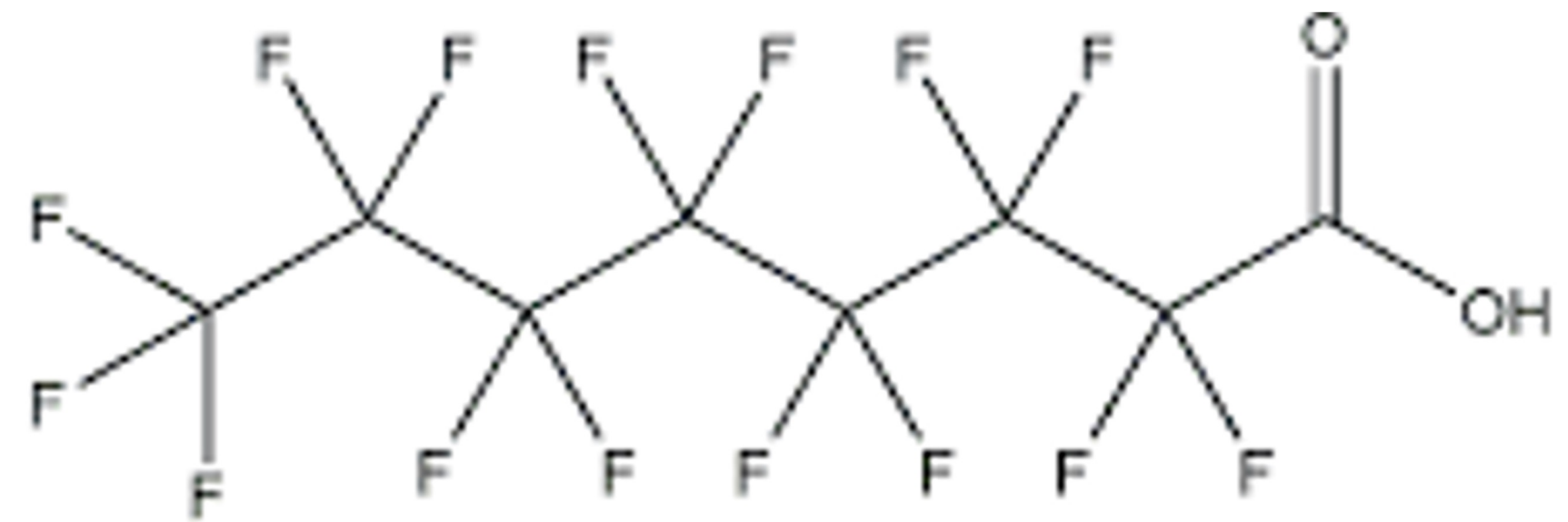
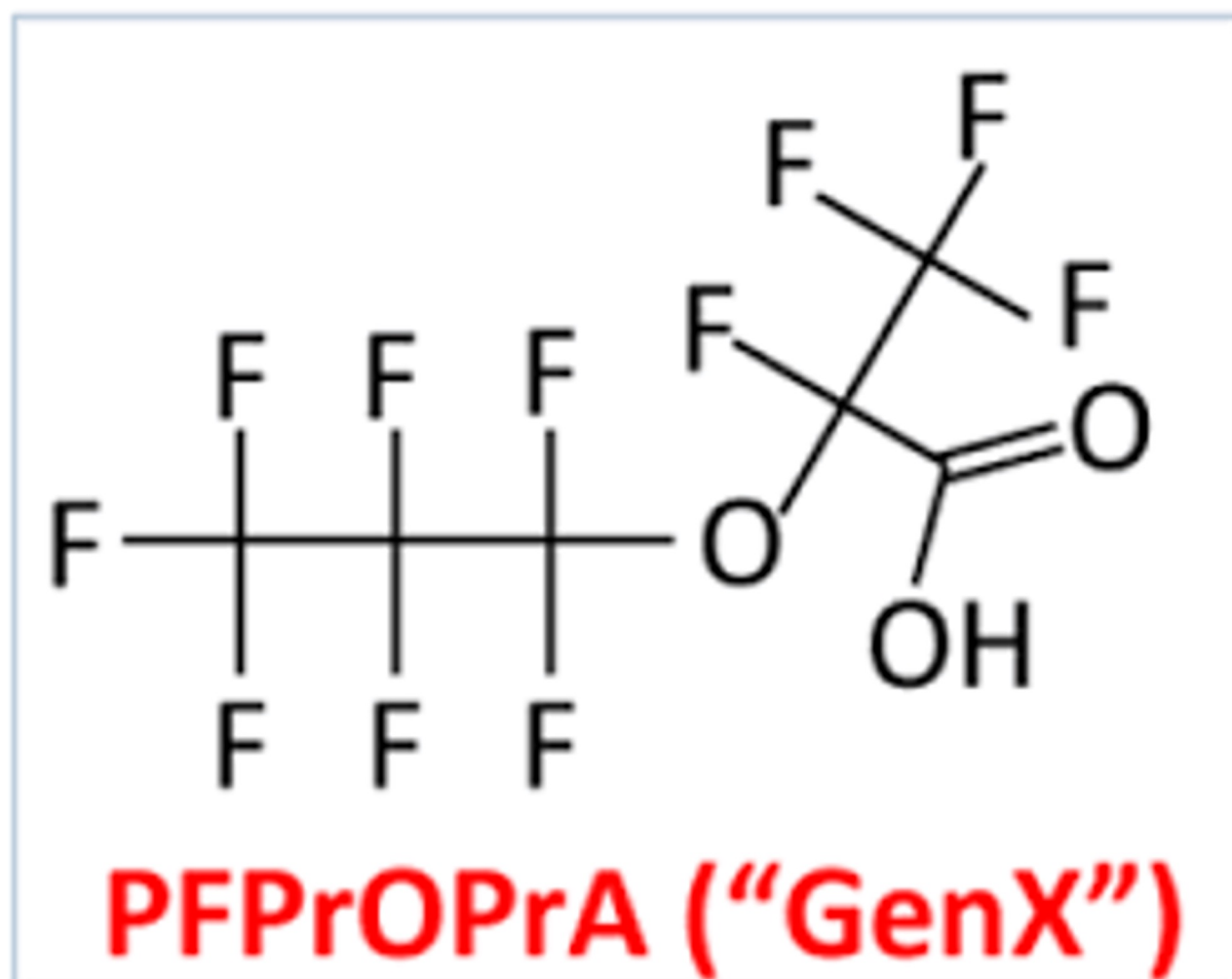
Figure 1. Family Tree of perfluoroalkyl and polyfluoroalkyl Substances

Image source: Agency for Toxic Substances and Disease Registry

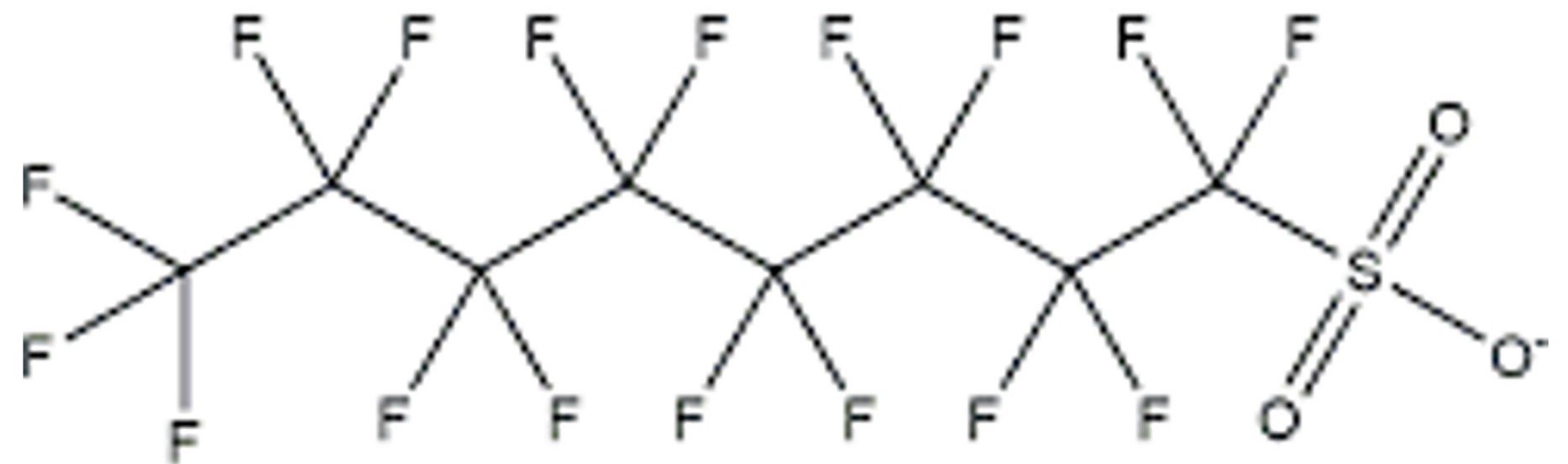
PFAS are persistent

What all PFAS have in common:

Carbon-fluorine bond



Perfluorooctanoic acid (PFOA)



Perfluorooctane sulfonate (PFOS)

Image Source: New Jersey Department of Environmental Protection

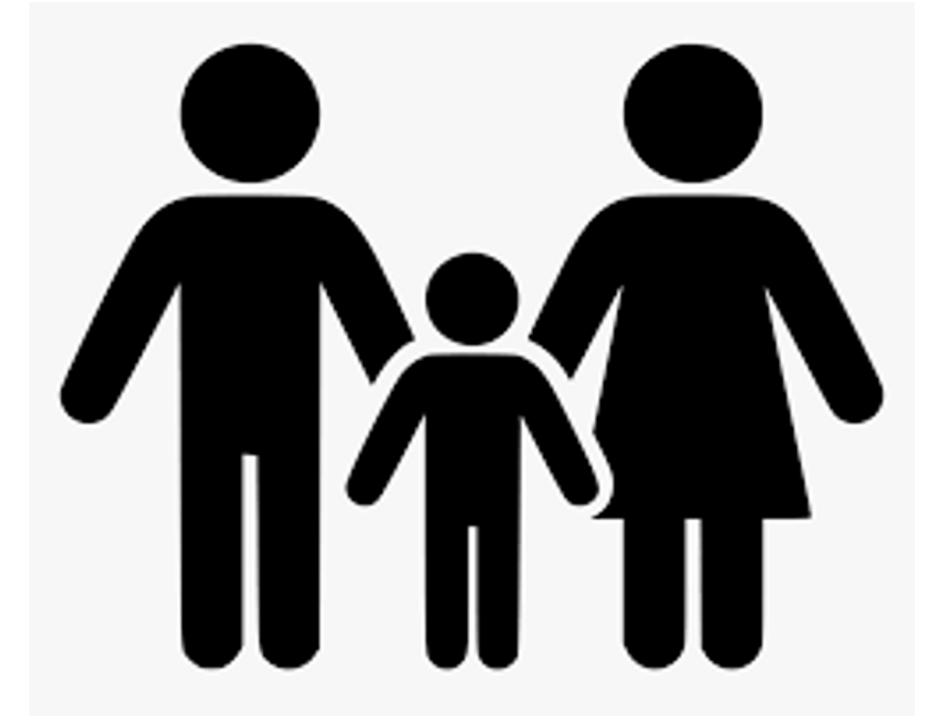
Commonly used PFAS are bioaccumulative

Bioaccumulative in humans, animals, plants

97-99% of Americans have PFAS in blood
(CDC NHANES annual sampling)

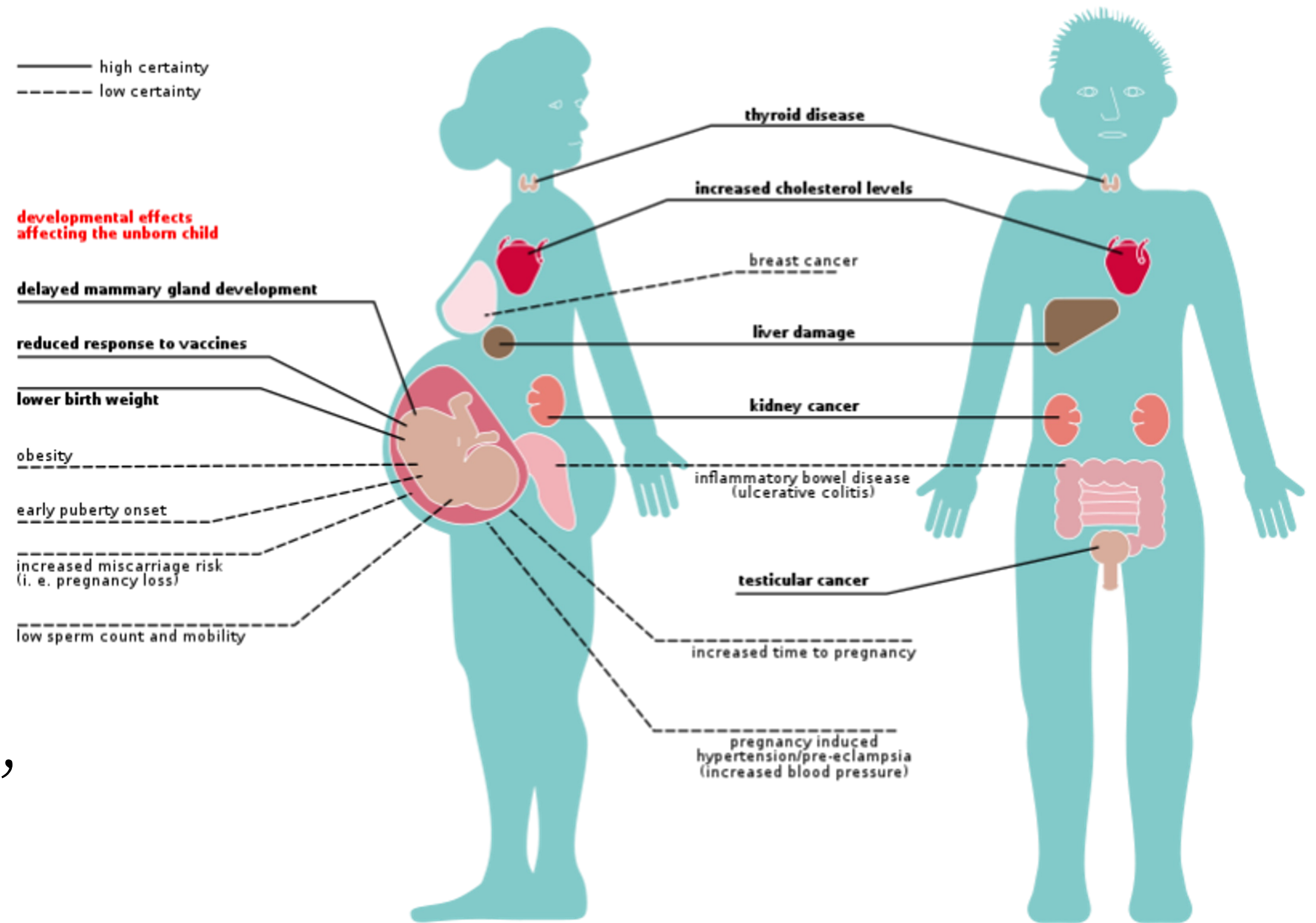
- 100% of breastfeeding mothers have multiple PFAS in milk (Toxic Free Future, Seattle)

- PFAS are in umbilical cords and newborn babies (Studies in EU, China, US)



PFAS can be toxic at very low levels

- Cancers (testicular, kidney, possible pancreatic)
- Endocrine disrupter (thyroid)
- Altered mammary gland development which may increase risk of breast cancer later in life
- Liver impacts, colitis
- High cholesterol/risk of pre-eclampsia
- Reproductive impacts (birth defects, decreased fertility, lowered birth weight)
- Increased risk of asthma
- Immunosuppressant



Possible effects of exposure to PFAS, from:

<https://www.eea.europa.eu/themes/human/chemicals/emerging-chemical-risks-in-europe>

(shared under Creative Commons)

PFAS are in the environment

PFAS do not stay put. They travel on air and in water and have been found all over the world.

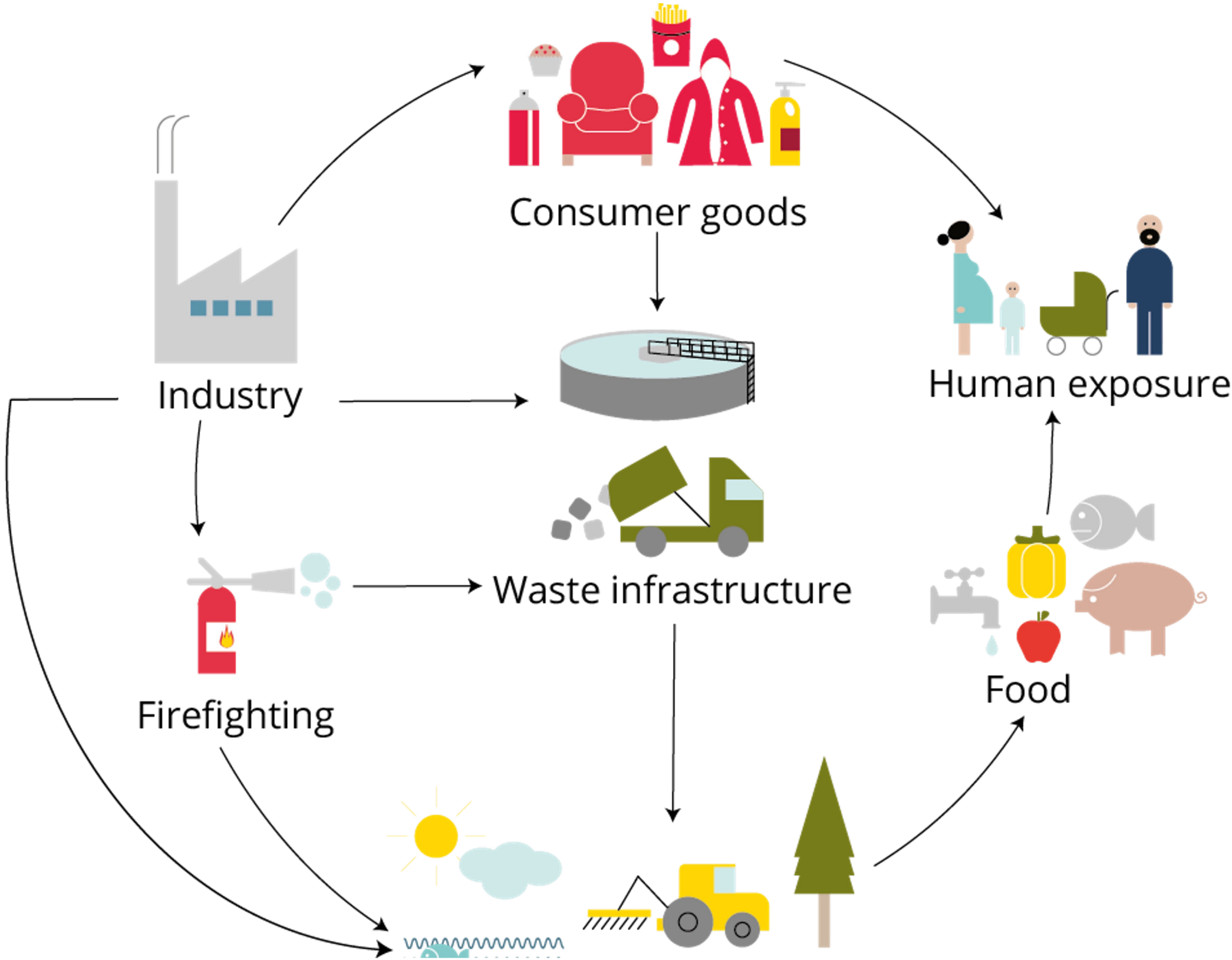


Image source: European Environment Agency

National PFAS contamination

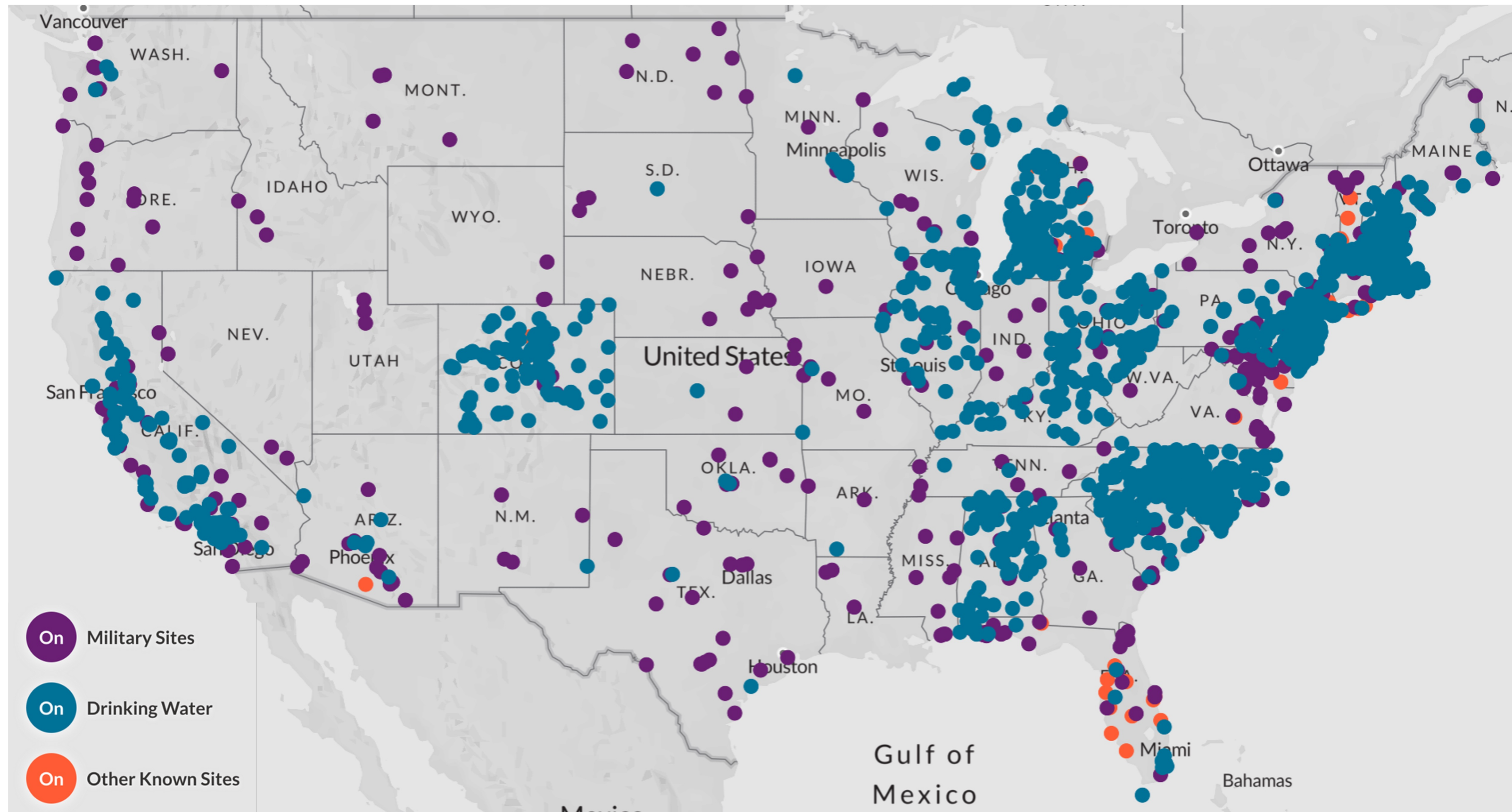


Image source: Environmental Working Group

PFAS Contamination in Massachusetts

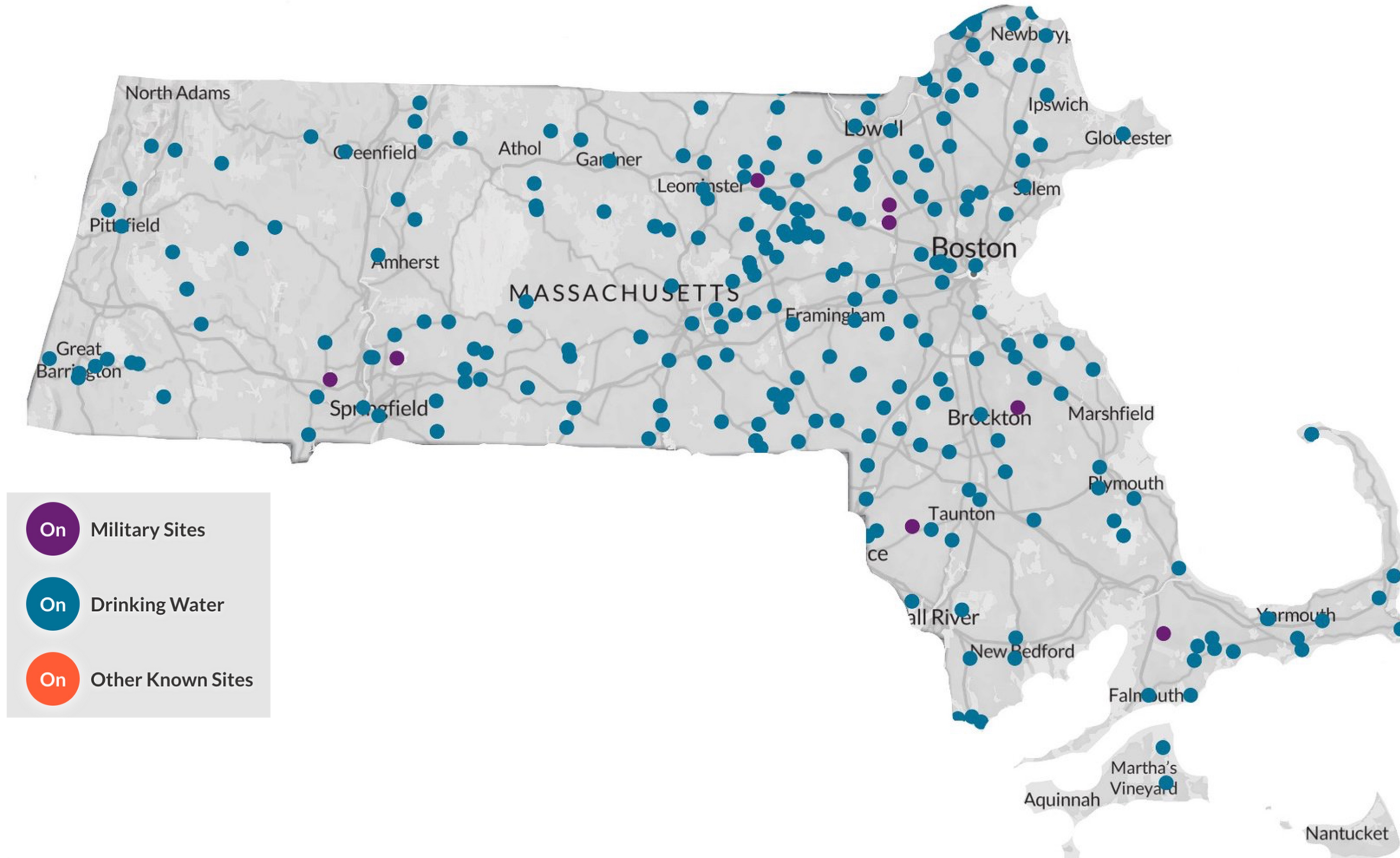


Image source: Environmental Working Group

Maximum Contaminant Limits

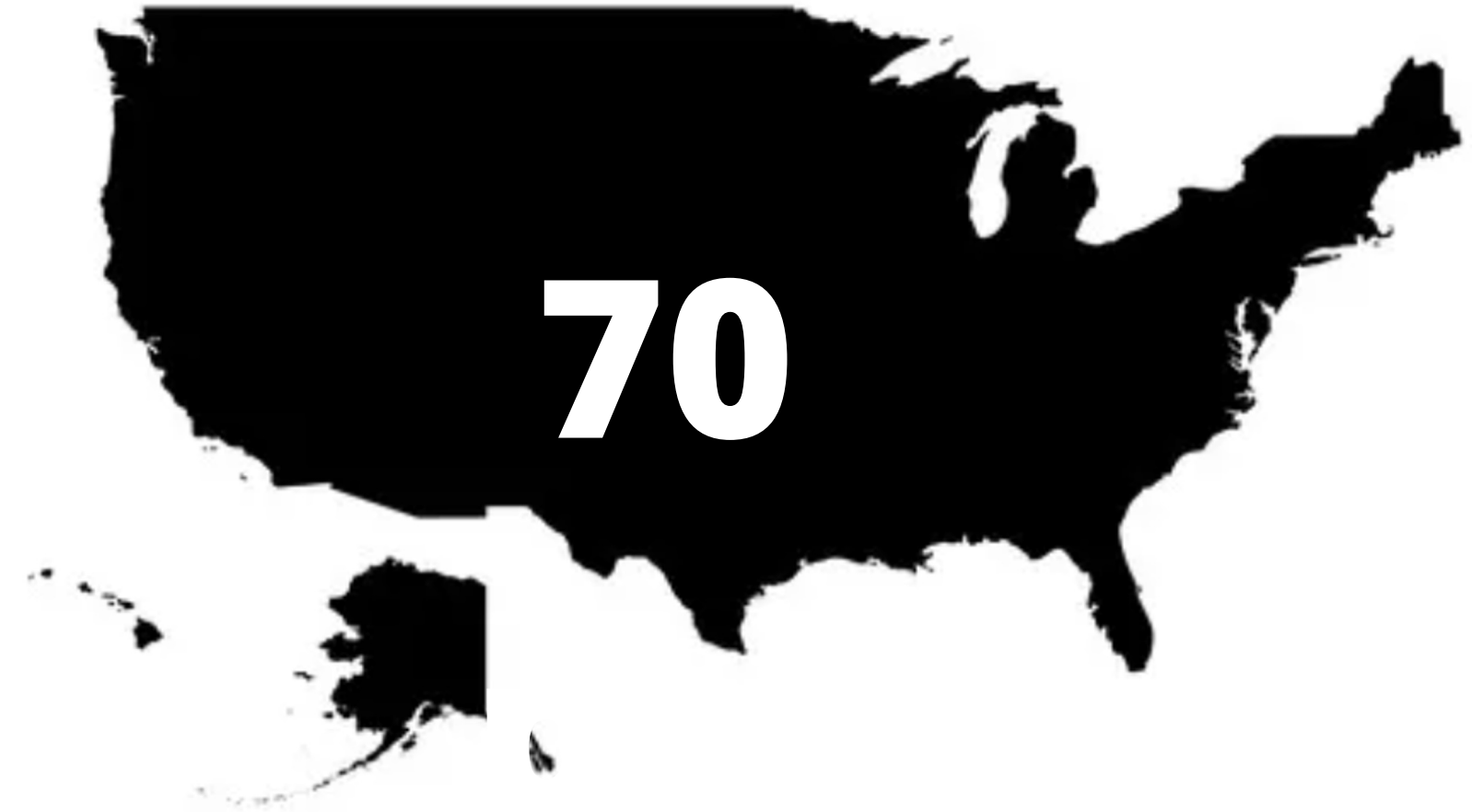
Massachusetts

Maximum Contaminant Level

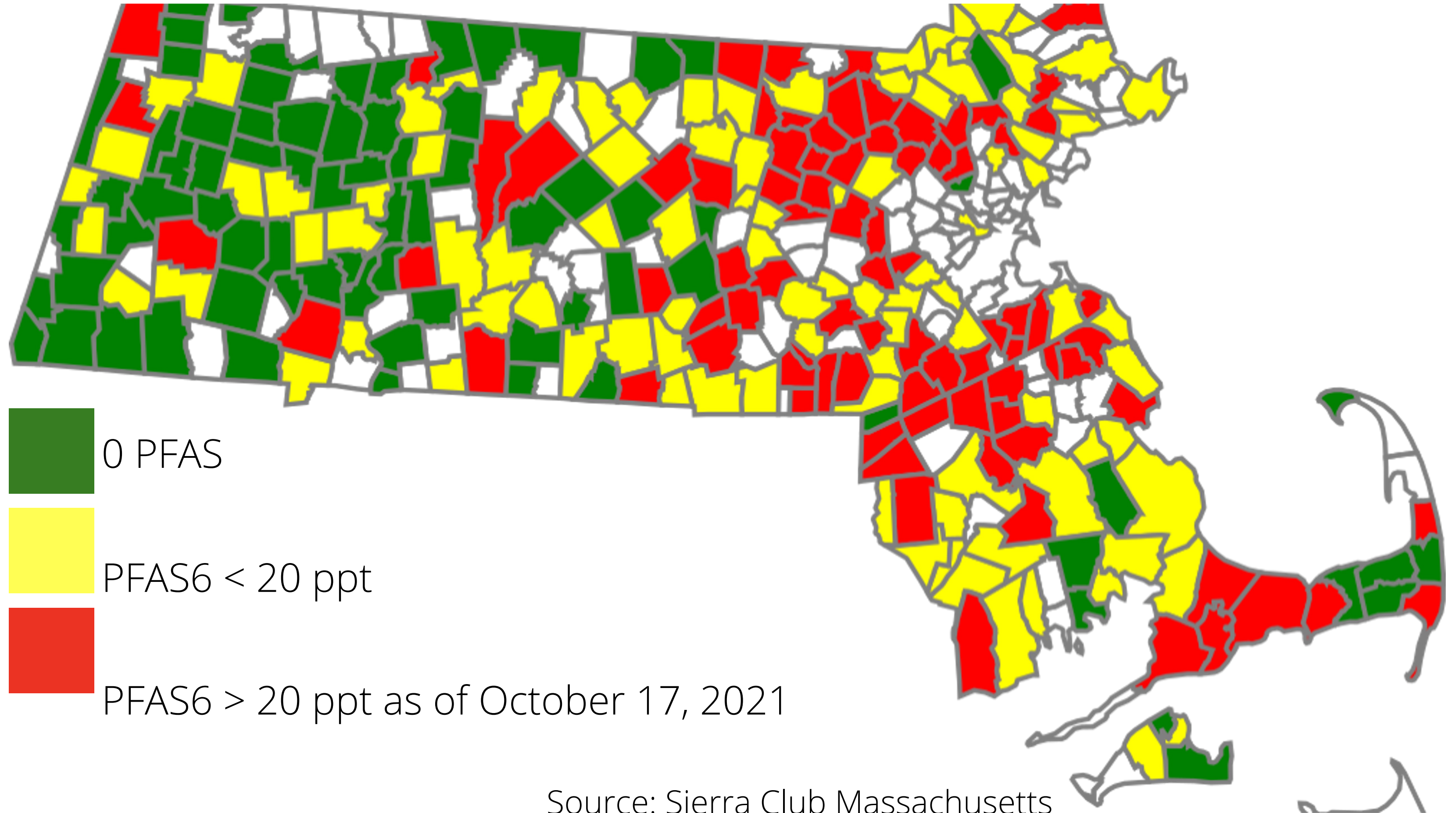
20 parts per trillion (ppt) for
combined total of 6 PFAS (**PFAS6**):



Federal advisory of **70 parts per trillion** for PFOA and PFOS

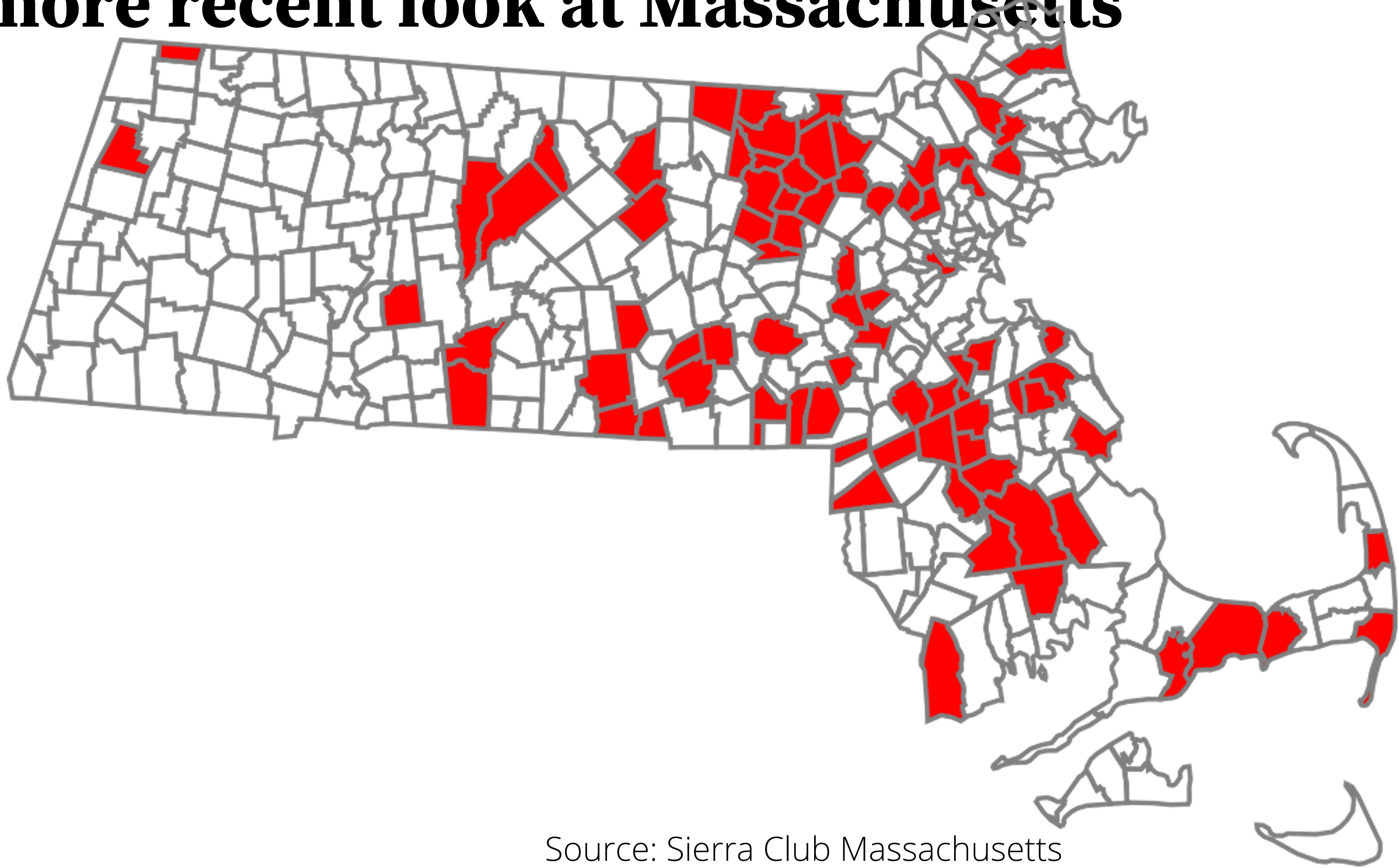


A closer look at Massachusetts



Source: Sierra Club Massachusetts

A more recent look at Massachusetts



Source: Sierra Club Massachusetts

If your town has PFAS₆ > 20 ppt

Drink and cook with PFAS-free water if you are:

- pregnant
- nursing
- an infant and/or
- a person who is immunocompromised

What about general public? MA DEP says that drinking water above MCL does not mean that adverse health effects will occur. While risks for general public are low, cannot be ruled out. Risk depends on level of chemicals in water and duration of exposure.

What about bathing and toothbrushing? Mass DEP considers safe.

What happens if water tests above limit?

If one sample is > 20 parts per trillion (ppt):

- Town must provide written notice to people in community.

If quarterly average of 3 samples is > 20 ppt:

- Town must lower PFAS in water to below 20 ppt.

Some options:

- Take wells offline;
- Connect to alternative water source;
- Treat water: Granular Activated Carbon, Reverse Osmosis.
 - Distribute bottled water
 - Water distribution station

MA DEP will oversee the process of lowering PFAS in water

If your town has not tested for PFAS:

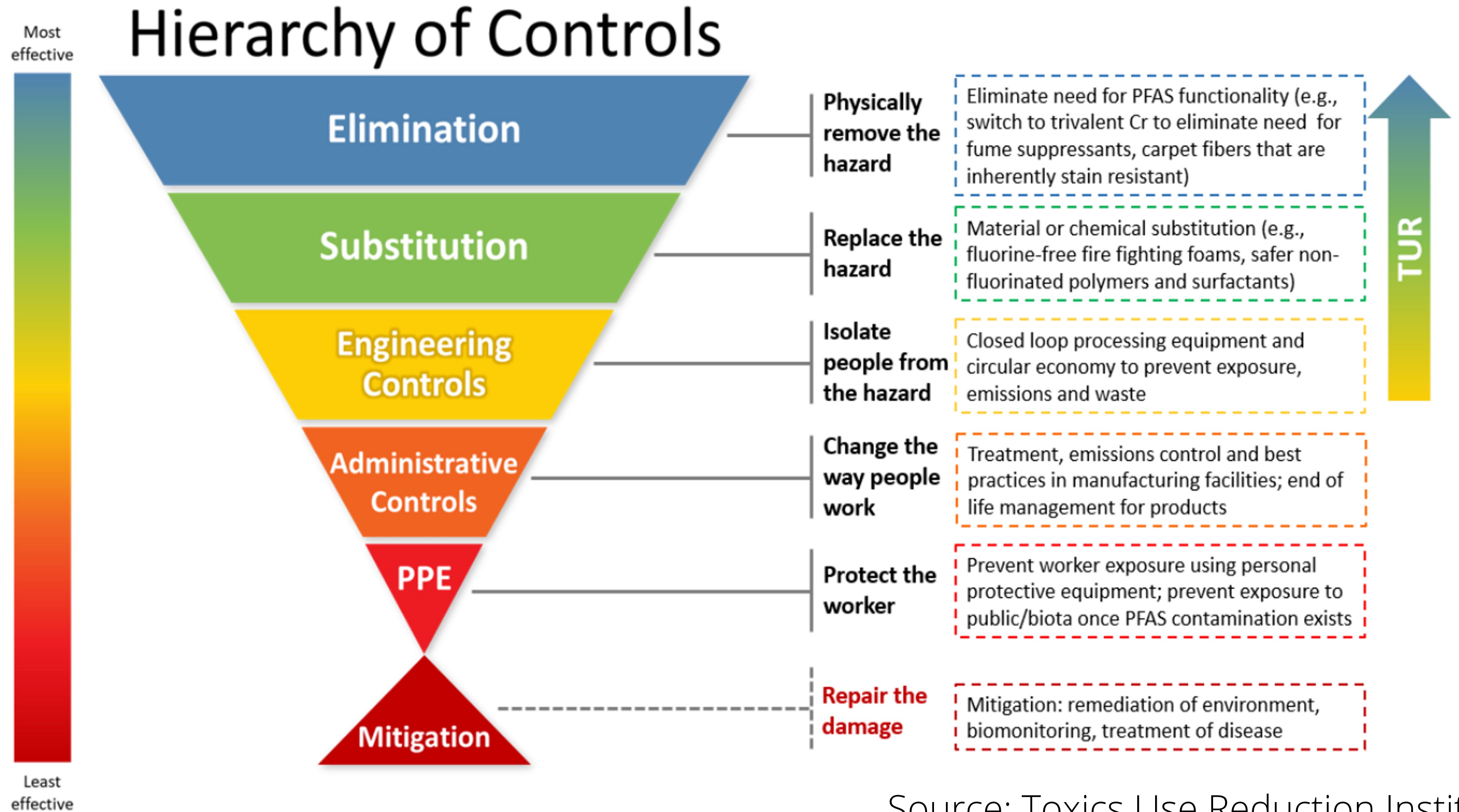
Contact: Your local water department

<https://www.mass.gov/lists/drinking-water-health-safety#contacts>

If you have a private well:

- Test your well water using a MassDEP approved testing lab and testing method. Follow MassDEP advice for gathering sample. See:
<https://www.mass.gov/info-details/per-and-polyfluoroalkyl-substances-pfas-in-private-well-drinking-water-supplies-faq>
- You can install whole house or point of use treatment, BUT most treatment will treat to the much higher federal level of **70 ppt**.

Toxics Use Reduction



Source: Toxics Use Reduction Institute

Food packaging

Avoid microwave popcorn

When buying take out food:

Take food out of wrapper as quickly as possible, especially hot, greasy food

Don't use wrapper as "place mat."

Don't store food in take out containers

PFAS may be in

paper or plastic food packaging

compostable fiber products, including molded fiber products that look "eco-friendly"

<https://saferchemicals.org/mind-the-store/>



Carpets/rug/textiles

- Carpets/rugs
- Furniture textiles and leathers
- Bedding
- Clothing-outdoor & high performance wear/shoes
- Clothing-- school/work uniforms
- Other: car seats, bibs, masks & face coverings
- "After market" sprays
- Outdoor gear: tents, umbrellas, sleeping bags

Some words to look for: stain-resistant, waterproof,

Find PFAS-free at: <https://pfascentral.org/pfas-free-products/>
and [madesafe.org](https://www.madesafe.org). Or google "Sierra Club"
and "PFAS-free outdoor gear."



Gardening/food

Residuals: Do not purchase fertilizer made of residuals

Artificial turf: Concern about PFAS in grass blades

Compost: Buy only compost from facilities that do not accept compostable foodware-- or only accept BPI-certified foodware



Photo: David Abel, The Boston Globe

Personal care products

Avoid **cosmetics** with PTFE & ingredients that start with "perfluoro-"
"

Most cosmetics with PFAS not labelled.

- Words to look for: long-lasting, waterproof, esp. mascara, foundation, lipstick

<https://www.ewg.org/skindeep/>

Major **dental floss** brands have PFAS.

- <https://pfascentral.org/pfas-free-products/> or

"Period underwear" often has PFAS.

www.madesafe.org

- Menstrual underwear:
Small study showed 11/17
products tested positive
for fluorine.



Cookware

Most non-stick cookware has PFAS.

Don't fall for: "PFOA, PFOS-free"

Some use bisphenol A. Small number of companies make silicone enamel options.

Uncoated is best. Cast iron, stoneware, glass, stainless steel

More info:

www.ecocenter.org

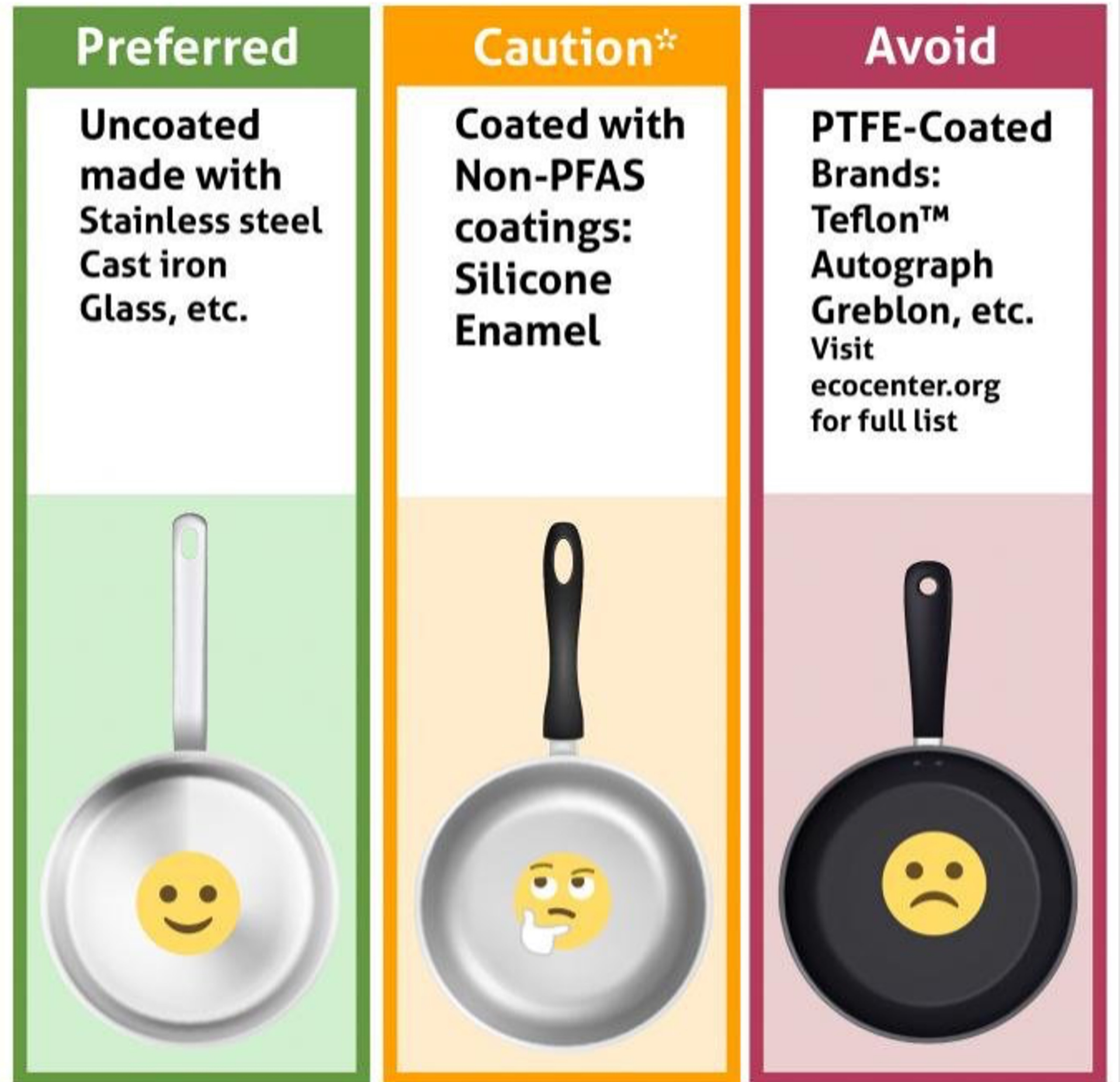


Image Source: Ecology Center

Materials developed under a grant from
the Toxics Use Reduction Institute,
UMass Lowell

Massachusetts has:

- Set Maximum Contaminant Levels for water;
- Funded water testing and treatment;
- Provided guidance to towns, cities, private well owners
- Taken legal action against PFAS manufacturers
- Coordinated a PFAS Interagency Task Force which studied PFAS in Massachusetts and developed recommendations

