Understanding How PFAS Chemicals and Plastics Affect Our Health and Environment in Alaska: The Latest Science and Recommendations to Prevent Further Harm

Pamela Miller, Executive Director
pamela@akaction.org

Cisco Mercado, Policy Director
francisco@akaction.org

Brittani Robbins, Civic Engagement Coordinator
brittani@akaction.org

ACAT
Alaska Community Action on Toxics

Alaska Community Action on Toxics (ACAT):

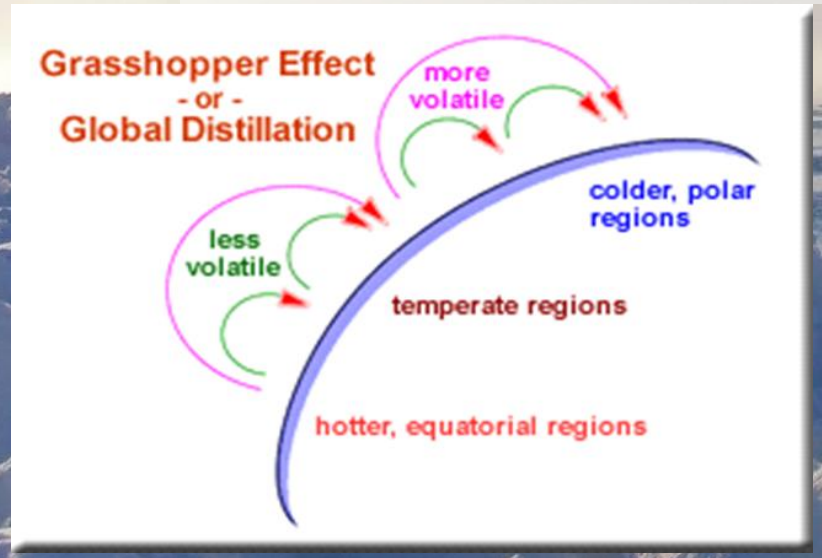
Mission: We believe everyone has the right to clean air, clean water, and toxic-free food. Driven by a core belief in environmental justice, ACAT empowers communities to eliminate exposure to toxics through collaborative research, shared science, education, organizing, and advocacy. We are committed to protecting the health of future generations.

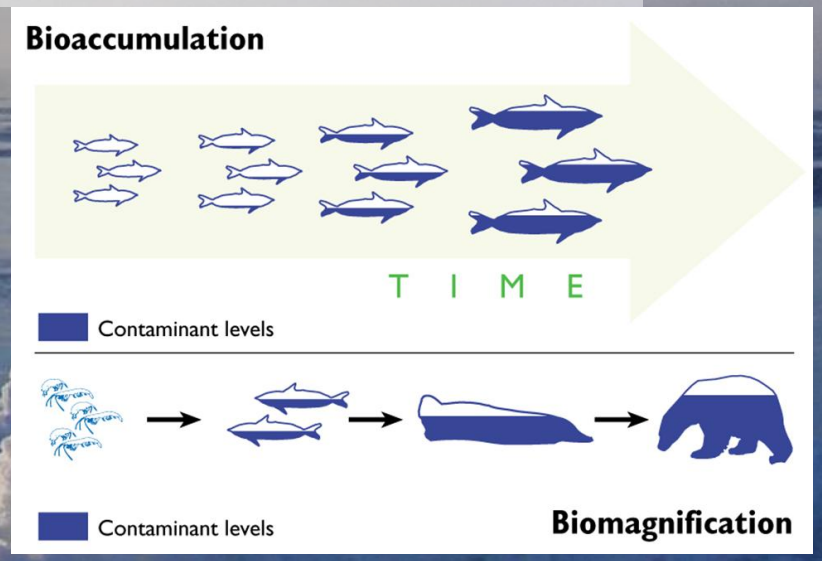
Our methods include:

- Community-based and participatory scientific research
- Public education and training
- Community organizing and advocacy
- Achieving policy change at the local to international levels

Global Transport of Persistent Chemicals and Climate Crisis in the North/Arctic

- The north is a hemispheric sink for persistent industrial chemicals and plastics
- Indigenous Peoples in the Circumpolar North face disproportionate exposures to toxic chemicals, and children are at highest risk
- Arctic Indigenous Peoples who rely on a traditional diet are particularly vulnerable to exposure and have levels of persistent contaminants in blood and breast milk that are among the highest of any population on Earth
- The mobilization and transport of contaminants into and within the Arctic is exacerbated by climate warming
- The Arctic is warming four times as fast as the rest of the world. Melting of Arctic ice, glaciers, and permafrost is releasing sequestered chemicals and microplastics into our environment and food web





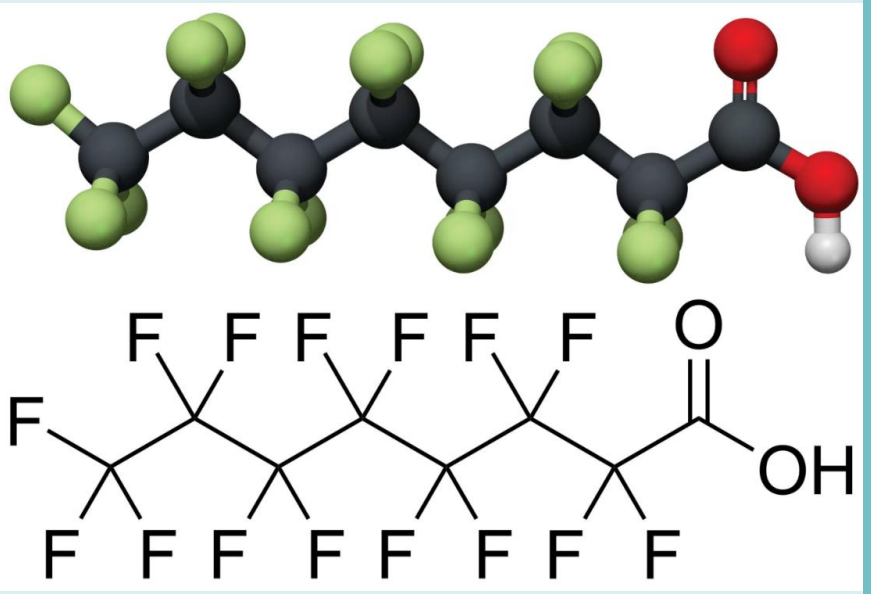
What are PFAS?
Per- and poly-fluoroalkyl substances
also known as highly fluorinated chemicals

What makes this class of chemicals unique?

- Persistence

  "Forever chemicals"
- Complexity

  Nearly **15,000** substances
- Versatility
- Used in many products



Perfluorooctanoic acid (PFOA) or C8

Widely used in products

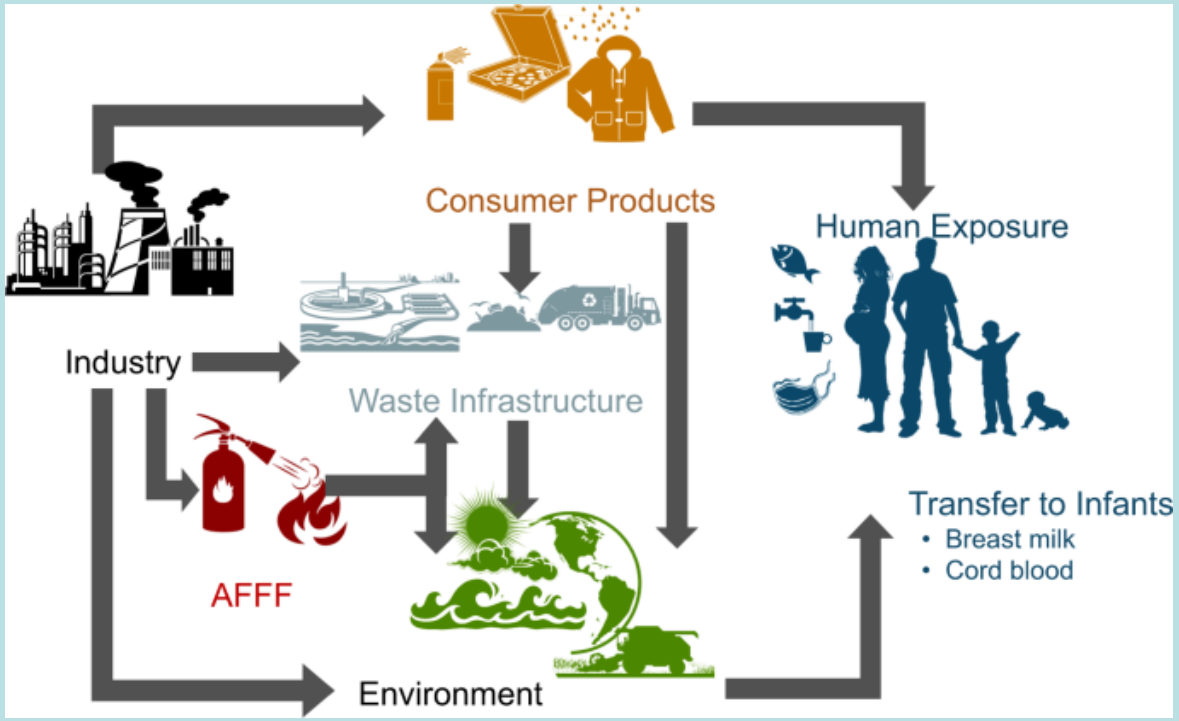
- Fire fighting foam
- Carpets, upholstery
- Waterproof fabrics
- Waxes (floor, skis)
- Non-stick cookware
- Paints and coatings
- Food packaging
- Personal care products
- Dental floss
- Electronics—semiconductors
- Metal plating

Sources of Drinking Water Contamination

- AFFF (aqueous film-forming foam) for fuel and chemical fires
- Production facilities
- Waste disposal sites
- Wastewater
- Other industries

Exposure to PFAS

- Contaminated drinking water
- Food
- Direct contact with products
- Household dust
- Air
- Cord blood
- Breast milk
- Infant formula
- Widespread exposures—found in **98%** of the US population
- no known safe level of PFAS exposure

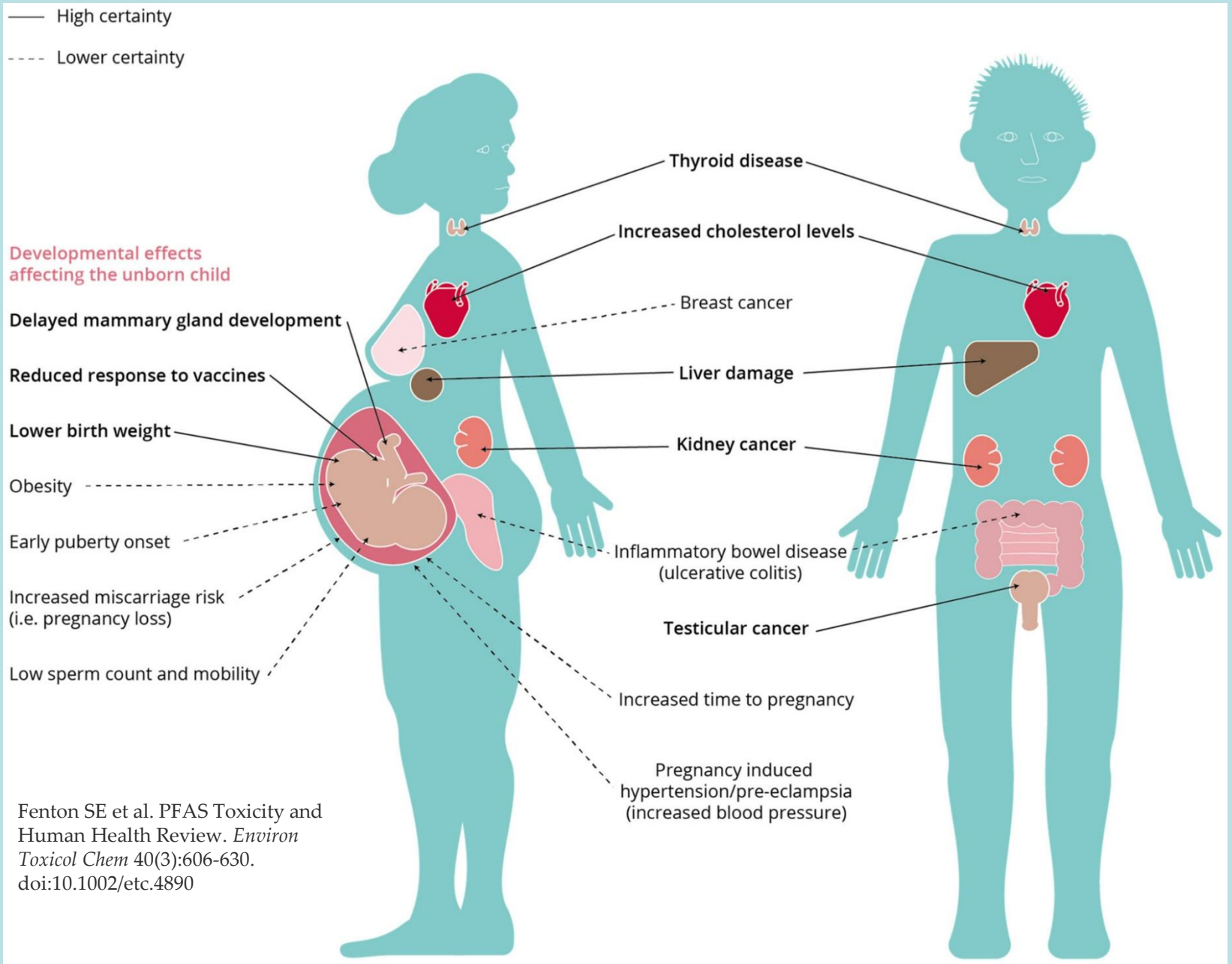


Health outcomes associated with PFAS exposure

PFAS exposure has been linked to:

- Pregnancy-induced hypertension/ pre-eclampsia
- Liver damage
- Increased cholesterol
- Increased risk of thyroid disease/cancer
- Increased risk of kidney, testicular, prostate, and breast cancer
- Increased risk of asthma
- Decreased fertility
- Decreased birth weight
- Immunosuppression—increased risk of infection and reduced vaccine response
- Increased risk of type 2 diabetes in women
- Developmental effects or delays in children

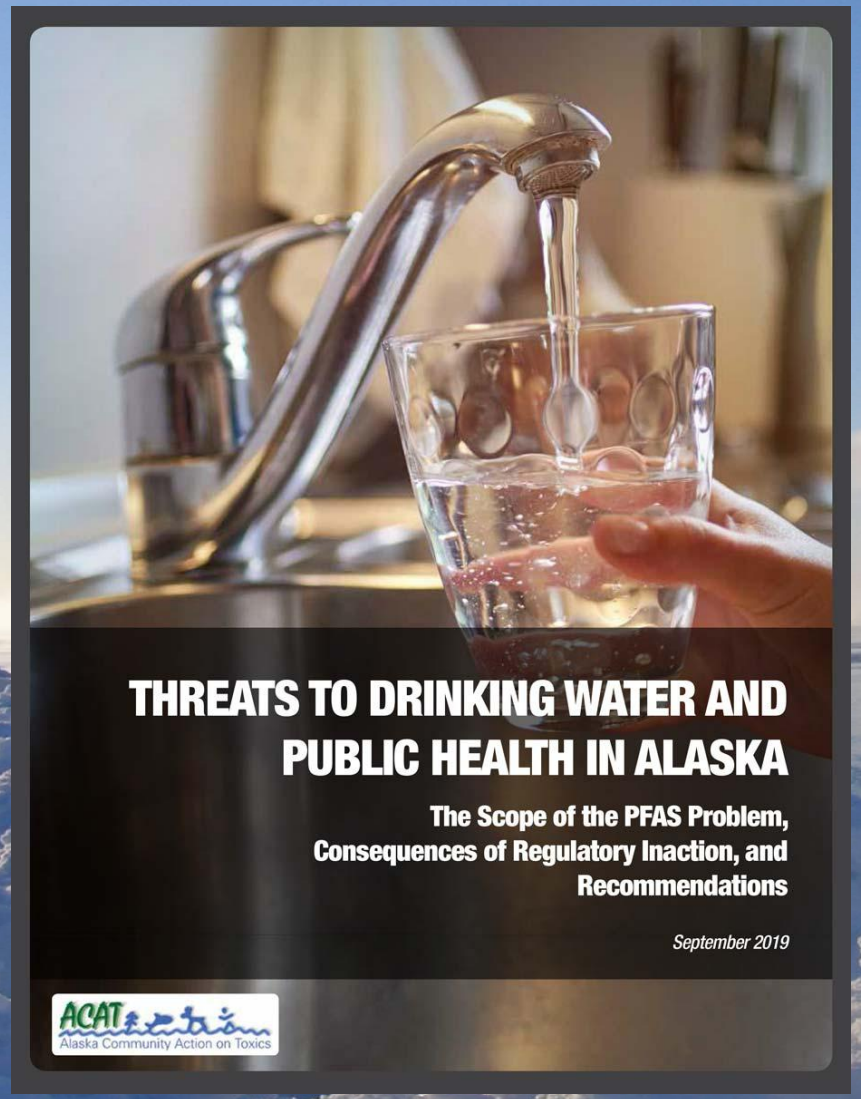
Effects of per- and polyfluoroalkyl substances on human health

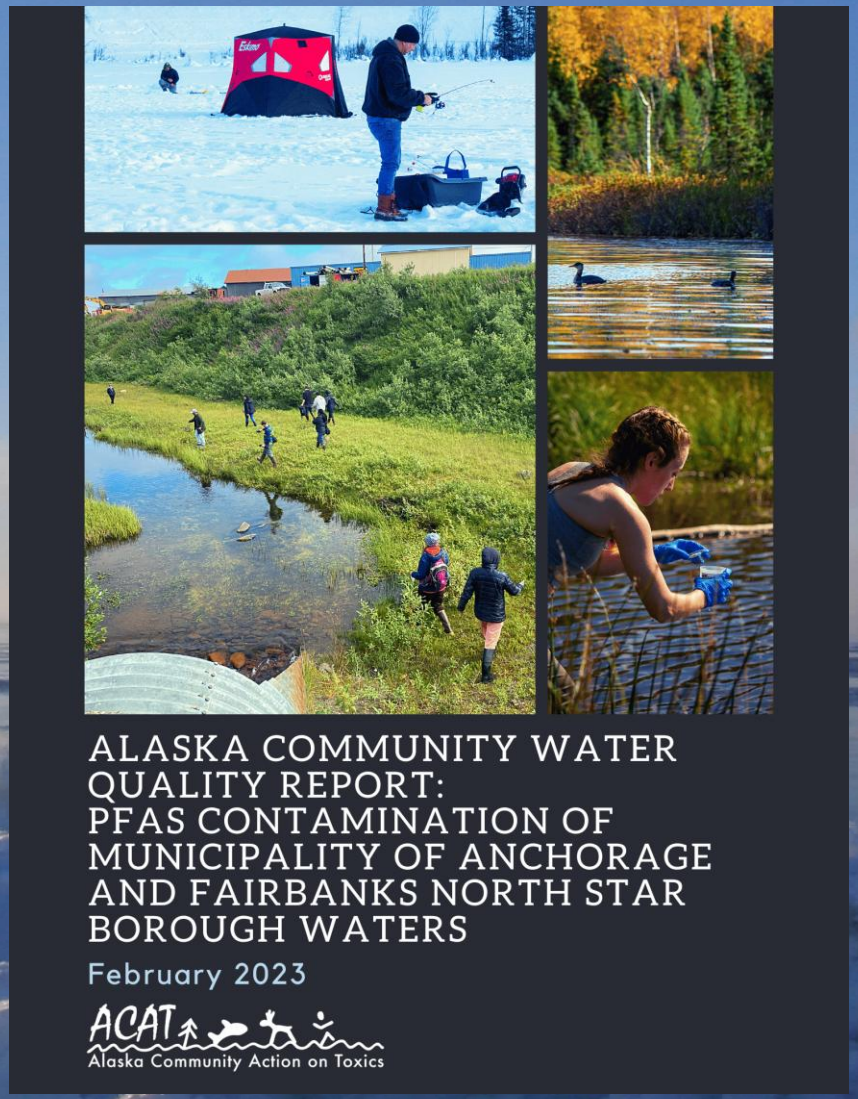


Fenton SE et al. PFAS Toxicity and Human Health Review. *Environ Toxicol Chem* 40(3):606-630. doi:10.1002/etc.4890

Investigative reports about PFAS in Alaska

https://www.akaction.org/media/publications/





PFAS in Alaska

- 469 sites in Alaska where PFAS contamination has been found in soil and/or water.
- Many Alaska communities have PFAS in their drinking water at levels deemed unsafe by the U.S. EPA.
- These include: Fairbanks, Moose Creek, North Pole, Eielson, Gustavus, King Salmon, Dillingham, Utquigvik, Eareckson (Shemya), and Yakutat.
- Lakes closed to fishing so far include: Polaris Lake, Kimberly Lake.

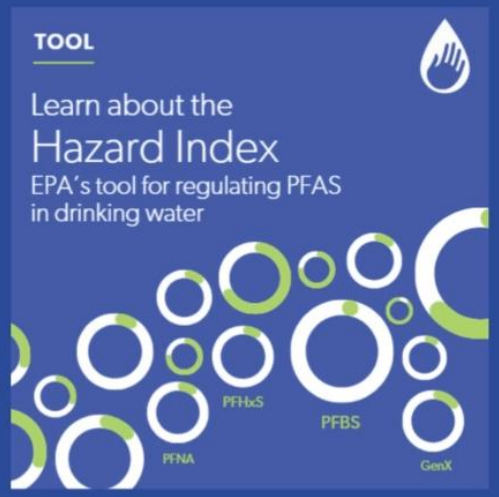
Health Protective Drinking Water Standards

LIMITING PFAS: STANDARDS DEFINED

EPA set legal limits for six PFAS chemicals known to be toxic to human health and the environment.

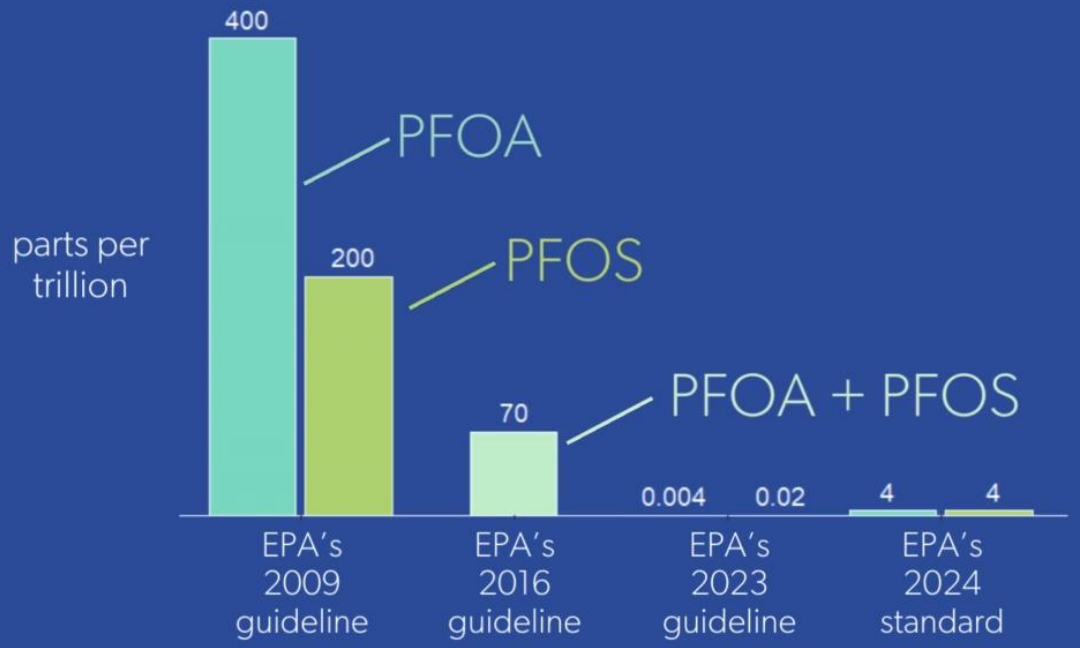
- PFOA and PFOS: 4 parts per trillion (ppt), individually
- PFNA, PFHxS, and GenX: 10 ppt, individually
- PFNA, PFHxS, GenX, and PFBS: hazard index of 1.0

To learn more about the standards, check out the Resources section of the PFAS Exchange, including a visual guide to the hazard index.



LIMITING PFAS: SCIENCE IN ACTION

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.



PFAS in drinking water and serum of the people of a southeast Alaska community

- Published in the scientific journal *Environmental Pollution*: https://pubmed.ncbi.nlm.nih.gov/35367506/
- Collaborative research of ACAT, Gustavus PFAS Action Coalition, and Indiana University
- Key findings:
- Our study found fourteen distinct PFAS in Gustavus water samples and seventeen different PFAS in serum.
- Perfluorooctanesulfonic acid (PFOS) and perfluorohexanesulfonic acid (PFHxS) were the most abundant PFAS in both water and serum samples.
- We also found that contaminated drinking water from private wells contributes to the overall PFAS body burden in Gustavus residents.

GreenScreen for Safer Products: Alternatives to PFAS-based firefighting foams and food packaging

- GreenScreen Certified™ Standard for Firefighting Foam (v.2)
- https://www.greenscreenchemicals.org/certified/fff-standard
- Class A Foam Concentrates, Class B Foam Concentrates, Class A Wetting Agents and Class A&B Wetting Agents
- GreenScreen for Reusable Food Packaging, Service Ware, & Cookware. https://www.greenscreenchemicals.org/certified/reusables

GreenScreen Certified®

CEH cpai

Policy recommendations for PFAS and other harmful chemicals

- Establish health-protective, enforceable drinking water standards using class-based approach (EPA standards as minimum).
- Pass comprehensive policy to prevent all non-essential uses of PFAS in products and require disclosure (example of MN's Amara's Law).
- Institute monitoring program that includes PFAS in water, fish, garden produce, and wildlife.
- Eliminate use of PFAS in firefighter gear in favor of safe alternatives.
- Prohibit uses of PFAS, heavy metals (e.g. lead, mercury), formaldehyde, triclosan, phthalates, and parabens in personal care products.

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Seguinot Medina DrPH, Vi Waghiyi.
Contributing authors—Tristin Furnary, Dylan Jones, Samantha Tracy.
Foreword by Dalee Sambo Dorough Ph.D., UAA
Design, editing: Charles Margulis, Karen Han, Vito Buonsante.
Available at: www.akaction.org; www.ipen.org

The Arctic as a

HEMISPHERIC SINK

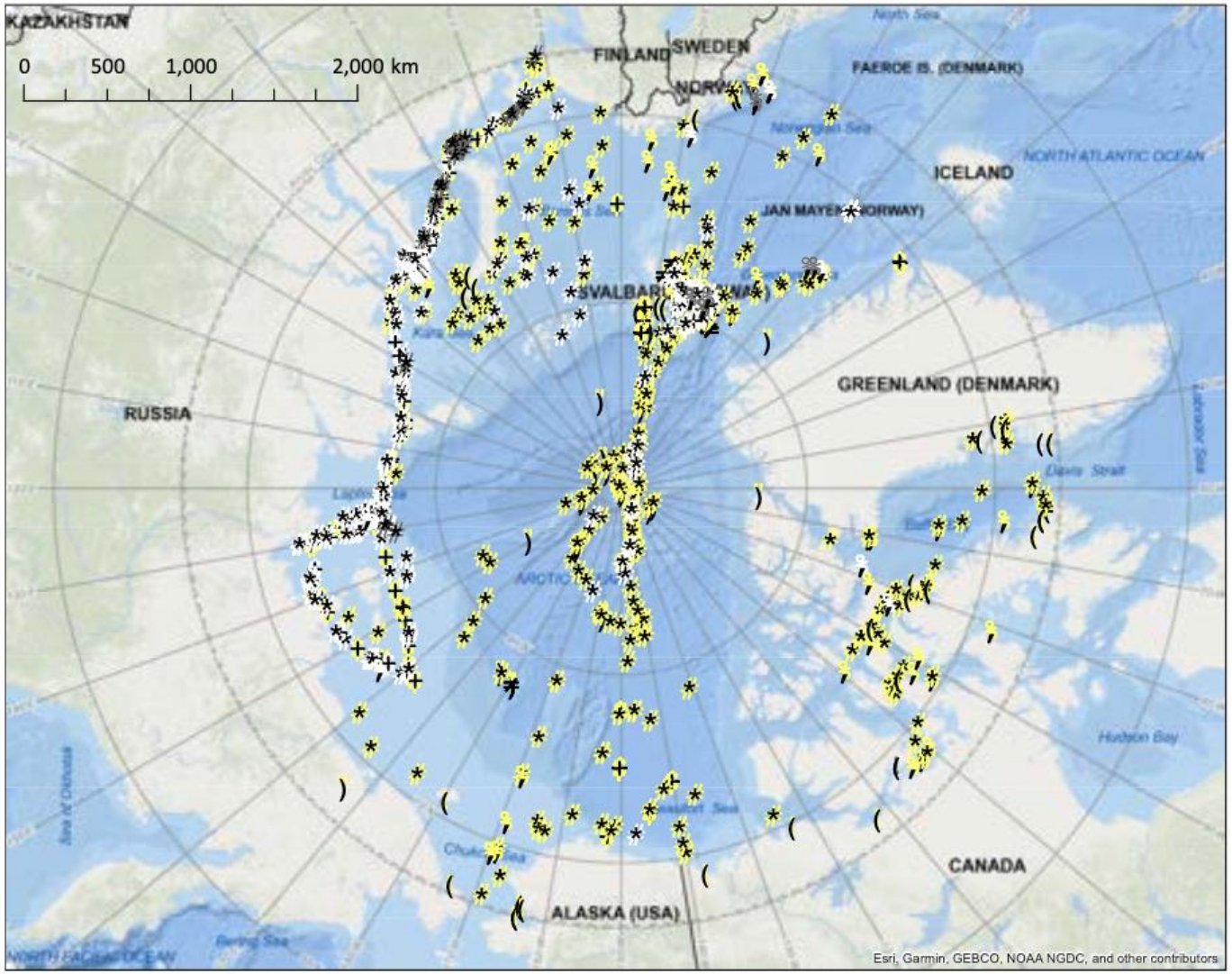

Figure 6 Documented concentrations of plastic litter, including microplastics, throughout the Arctic. Reprinted with permission of Dr. Melanie Bergmann, Alfred Wegener Institute.

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IPEN for a toxics-free future

Microplastics Are A Macro-problem

What are microplastics?
* Small plastic particles less than 5 mm

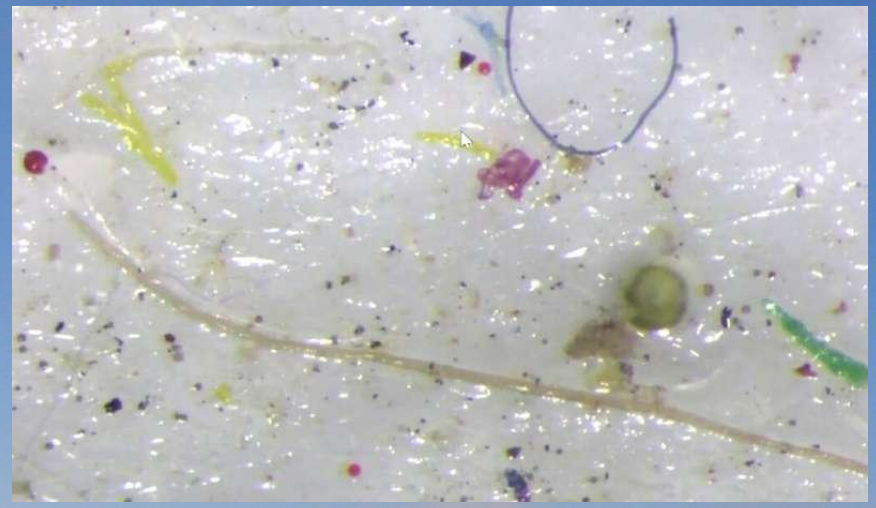
Sources
* Plastics manufacturing, synthetic clothing, packaging, building materials, furniture, personal care products, cleaning products, paints, fertilizers, tires, synthetic turf

How are we exposed?
* Air, drinking water, food, household dust

Why should we be concerned?
* Toxic additives, including plasticizers, flame retardants, and stabilizers
* Americans consume as much as 125,000 microplastic particles per year
* Found in lungs, heart, liver, kidney, placenta, reproductive organs, bladder, breast milk
* May contribute to increased risk of cancer, infertility, cardiovascular, and neurodevelopmental harm

Report Findings: Microplastics in the Arctic

- At least 62,000 tons of plastics enter the Arctic Ocean every year.
- The Arctic Ocean contains the highest concentrations of microplastics than any other ocean basin in the world.
- 210,000 metric tons of microplastics in seawater, sea ice, and sediments of the Beaufort and Chukchi Seas.
- Arctic sea ice is a major global sink for microplastic particles.
- Concentrations of microplastics are highest in areas of the most rapid sea ice melting.
- Thousands of tons of chemical additives are transported with plastic debris to the Arctic each year.



Report Findings: Microplastics in the Arctic

- Microplastics have been found in Arctic marine mammals, including: bearded seals, ringed seals, spotted seals, Pacific walrus, beluga whales, fin whales, gray whales, humpback whales, and minke whales.
- Evidence shows translocation into tissues of marine mammals including lung, blubber, muscle, liver, acoustic fat pad, and melon (fatty tissue found in the foreheads of all toothed whales that acts as a "sound lens)." In fetuses, amniotic fluid and placentas of pregnant spotted seals.
- Arctic seabirds are exposed to hormone disrupting chemicals, such as phthalates and UV stabilizers, through ingestion of microplastics.
- 386 marine fish species worldwide have been found to have ingested plastic debris including 210 species of commercial importance. Over the last decade the incidence has doubled, increasing by almost 2.5% per year.

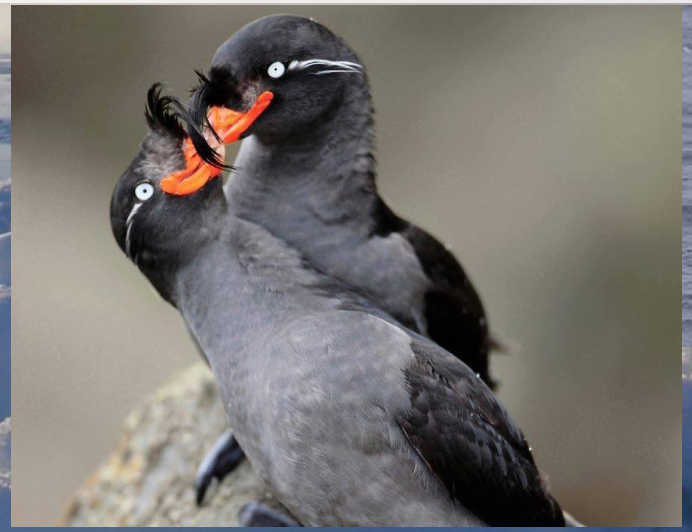
State of the Science Report on Hazardous Chemicals in Plastics—January 2024

Research Council of Norway and Norwegian University of Science and Technology

- > 16,000 plastic chemicals; 25% of which classified hazardous
- No plastic chemical classified as “safe”
- Evidence-based classification and prioritization of chemicals and polymers of concern is possible
- January 2024 State of the Science report

UV-328:
A Global Pollutant Conveyed to Remote Regions in Microplastics

- **What is UV-328**? A high production volume benzotriazole-type chemical additive used as a UV absorber in plastics.
- UV-328 undergoes long-range transport through plastics and is persistent, bioaccumulative and toxic.
- Nominated for global ban under the Stockholm Convention in 2020 by Switzerland; listed in 2023.
- "***Given UV-328's proliferation in plastic products, such a listing would strengthen the Stockholm Convention's role as a key, additional, instrument for governments across the globe to tackle the growing plastic waste crisis.***"
- UV-328 is found in high concentrations in preen gland oil of seabirds sampled on remote islands around the globe and in other marine wildlife.
- Detected in human milk. Liver and kidney toxicity; anti-androgenic effects in *in vitro* studies.



Plastic Particles In Utero, Infants, Children

Plastic particles & chemical additives are found in:

- Placenta, which supports fetal growth and development.
  - One study found 60% of placenta samples had plastic particles in 2006, 90% in 2013, and ***100% in 2021.***
- Newborns' first stool
- Breast milk
- Infant formula

Brains are targets: Plastic particles cross the blood-brain barrier.

Babies enter the world today with their brains and bodies contaminated with plastics.

Impacts on Child Brain Development

Plastic Particles & Chemical Additives Penetrate Cell Membranes and Impair Placental Function, affecting:

- Fetal growth;
- Brain Growth & Development;
- Behavior, Motor Function, Learning, and Memory.

Plastic particles were found in all placentas of low weight babies, but only in 10% from normal weight babies.

Babies with higher microplastics exposure had:

- Lower birthweight, length, and head circumference;
- Lower Apgar score.

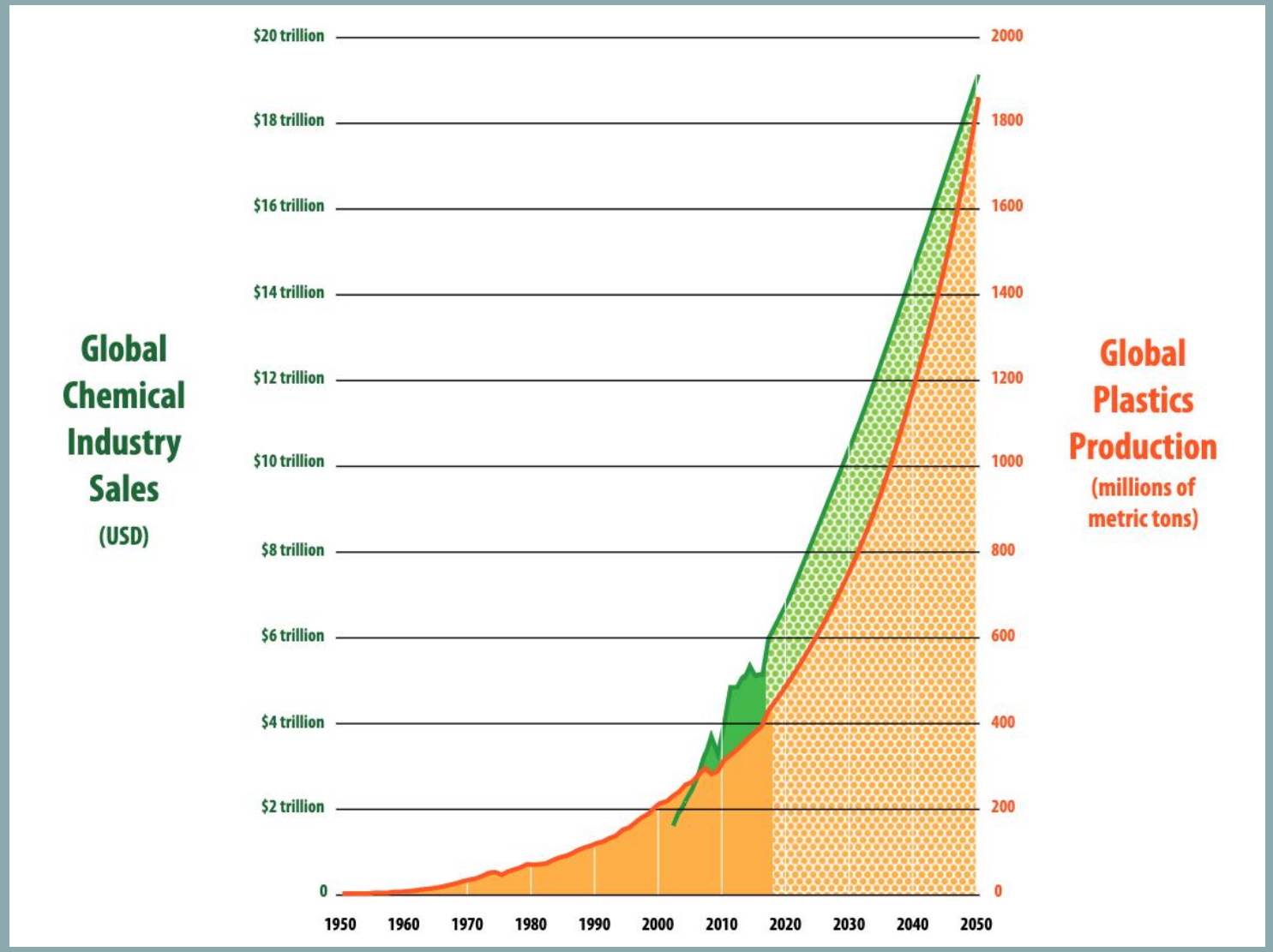
Overwhelming Evidence of Neurotoxicity

Overwhelming evidence for some classes of chemicals in plastics shows prenatal and early childhood exposures contribute to problems with child brain development and neurodevelopmental disorders.

- Phthalates
- PBDE Flame Retardants
- Bisphenols

These chemical classes and their substitutes:

- Leach from plastics into food and dust.
- Are widely found in pregnant women, infants, and children.
- Pass to the fetus via the placenta, and to the infant via breastmilk and formula.



More plastics produced means

MORE PLASTIC POLLUTION

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U.N. adopts historic resolution (March 2, 2022): the United Nations agreement lays out a plan for developing a legally binding treaty by the end of 2024 aimed at ending plastic pollution

Recommendations For State Policy

- Ban intentionally added microplastics in consumer products
- Eliminate unnecessary plastics use and promote non-toxic reuse
- Eliminate the most hazardous plastics (such as PVC, polystyrene) and plastic additives (including plasticizers, flame retardants, stabilizers)
- Develop a microplastics testing strategy

Dr. Marcos Orellana, United Nations Special Rapporteur on Toxics and Human Rights: stages of the plastics cycle and their impacts on human rights

- *Each stage of the plastics cycle has direct and adverse impacts on the enjoyment of human rights. This includes extraction and transport of fossil fuels that are used to make virgin plastic; the release of hazardous substances during plastics production that affect fenceline communities; the exposure during use to the hazardous chemicals added to plastics; and the mountains of plastics and microplastic waste that is mismanaged. To be effective, the plastic treaty must address all stages of the plastics cycle."*

- *"Safeguarding the human rights of present and future generations that are compromised by the growing toxification of the planet demands that the international community reverse the plastics crisis. Addressing the negative impacts of the plastics cycle on human rights and integrating a human rights-based approach to plastics policy are indispensable for effective and legitimate solutions to the global plastics problem."*

A Plastics Treaty that Protects Health!

We call for a strong plastics treaty that protects the health of children's developing brains by reducing the production and use of plastics and subsequent generation of plastic particles, and by preventing the harmful effects of plastics throughout their life cycle.

https://projecttendr.thearc.org/project-tendr-briefing-paper-protecting-the-developing-brains-of-children-from-plastics-and-toxic-chemicals-in-plastics/

Indigenous Peoples' knowledge is at the foundation of our community-based research—and a call to action

"We are overwhelmed with concern about the health harms associated with climate change, the loss of sea ice and melting permafrost and the mobilization of chemicals and plastics — these are all interconnected. We are running out of time!" *– Delbert Pungowiyi, Native Village of Savoonga*

"We have always been a vigilant people. Our community-based research enables us to be vigilant at the molecular level." *– Merle Apassingok, Native Village of Gambell*

"We don't just eat one chemical. We eat the whole fish." *– Violet Yeaton, Native Village of Port Graham*

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THANK YOU!

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