THE THREAT OF PFAS

THE FOREVER CHEMICALS

A call for Canadian Citizen Action to protect the
Great Lakes – St. Lawrence River Ecosystem

Canadian Environmental Law Association
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The Great Lakes – St. Lawrence River Ecosystem (GLSLR) contains 20% of the world's fresh surface water and it is home to half the population of Canada. Over the past decades, the impact of toxic chemicals to wildlife, particularly aquatic species in the GLSLR, has been the subject of policy and regulatory binational action achieving reduction of some persistent toxic substances including lead, PCBs, mercury, and mirex. An emerging class of chemicals are now threatening the GSLSR and its communities. Per- and Polyfluoroalkyl Substances (PFAS) are a class of chemicals often referred to as 'the forever chemicals' because they are highly persistent in the environment and will take hundreds if not thousands of years to disappear from the soil and groundwater where they accumulate.

In 2015, two chemicals Perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA), long-chain perflorocarboxylic acids (LC-PFCAs) and their salts and precursors in this class were designated as Chemicals of Mutual Concern (CMCs) in the Great Lakes Basin by the US and Canadian governments due to their impact on wildlife. Recently the class of PFAS was added as a contaminant in the Ontario Guide to Eating Fish.

While there are over 4700 known PFAS available on the market, most of these PFAS are not included in the designation as Chemicals of Mutual Concern in the Great Lakes Basin.

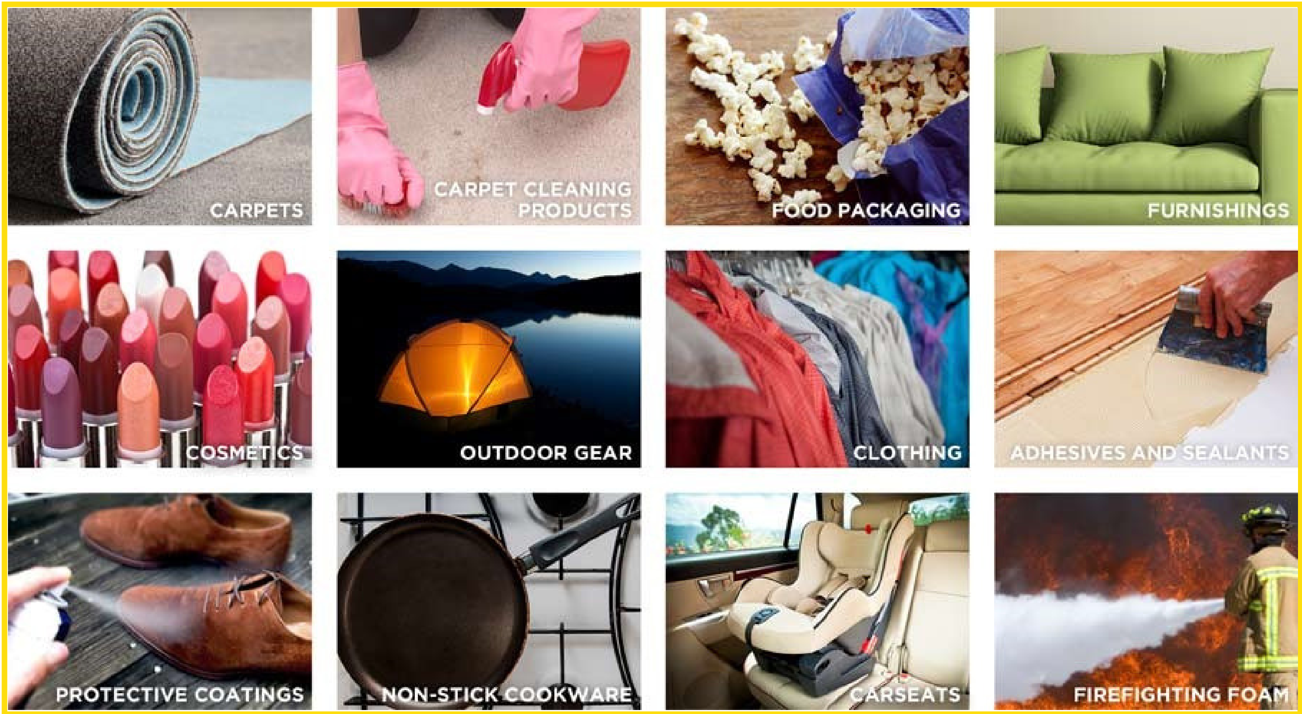
Great Lakes Herring Gull and Eggs

PFOS concentrations in top-predator fish species and herring gull eggs in the Great Lakes have been found to exceed Canadian guidelines for the protection of bird and animals that consume fish and wildlife.

Photo credit: International Joint Commission

This chemical class is not found in nature and some PFAS are now discovered to be global contaminants.

WHAT ARE PFAS AND HOW ARE THEY USED?



Credit: Green Science Policy Institute

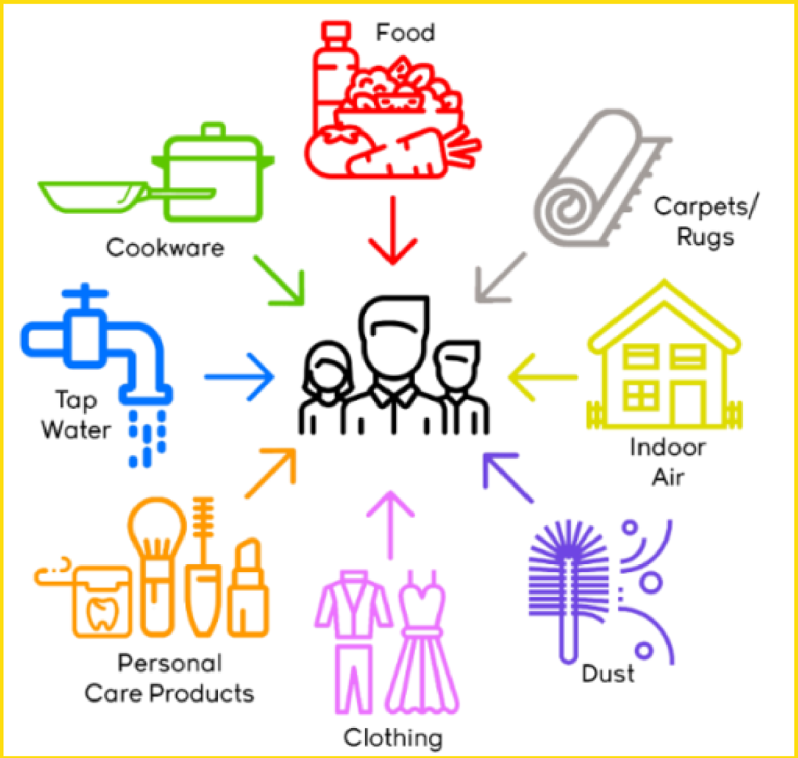
PFAS have been produced and widely used for over fifty years due to their ability to resist grease, water, and oil. The majority of PFAS are used to make nonstick cookware; grease and waterproof coatings on food packaging (such as popcorn bags, fast food wrappers, and takeout containers); stain- and water-resistant textiles (outdoor and upholstered furniture, carpets, and clothing); some cosmetics, paints, and firefighting foam used to fight fuel-based fires. Due to sampling and analytical challenges, PFAS have only recently become recognized as widespread contaminants in water, air, biota and humans. In Canada there are no requirements to list PFAS in consumer products or to publicly report their use in industrial facilities, so the total amount of PFAS in products and industrial releases is unknown. This contributes to the fact that the public is not aware of the presence and use of PFAS in consumer products.

Health Canada's Biomonitoring program found all Canadians sampled to have PFOS and PFOA present in tissues or blood.[1] The half-life, or time it takes to eliminate half of the substance from the human body, for PFOS and PFOA, ranges from 2.8 to 8.5 years. A range of other PFAS are present in infants, children and adults.

HEALTH IMPACTS ASSOCIATED WITH PFAS

- INCREASED RISK OF CANCER
- KIDNEY AND LIVER DISEASE
- THYROID CONDITIONS
- PREGNANCY COMPLICATIONS
- AUTO-IMMUNE DISORDERS
- INCREASED CHOLESTEROL
- HORMONE DISRUPTION

HOW WE ARE EXPOSED TO PFAS



Exposure routes of PFAS to the general public.

Credit: Natural Resources Defense Council

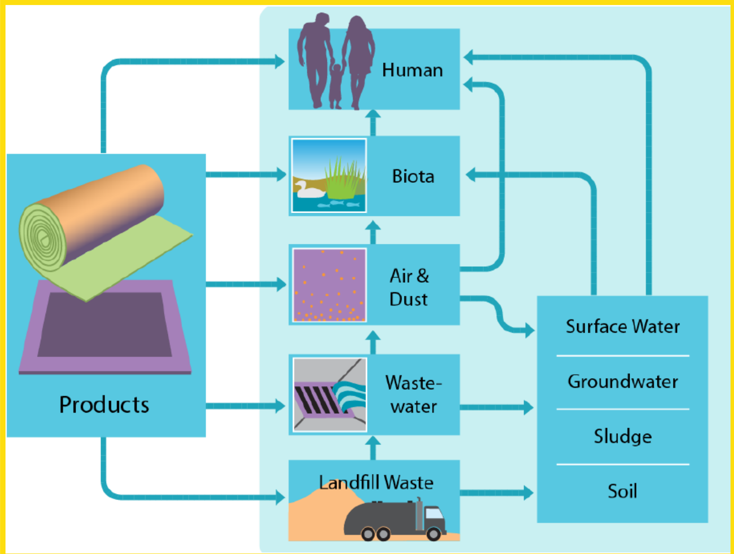
The ongoing presence of PFAS in consumer products has resulted in the widespread presence of PFAS in house dust. According to Health Canada, main routes of exposure to PFAS for adults in the general population are linked to ingestion of food, drinking water, and house dust that contain these chemicals.[2]

Children are most at risk from PFAS exposure in consumer goods. Infants, toddlers, and children have the most exposure from hand-to-mouth contact with consumer products, such as carpets, clothing, and upholstery that have been treated with PFAS.

The use of PFAS for over fifty years in products and manufacturing facilities has resulted in a PFAS-waste problem and the ongoing use of PFAS in products is contributing to an increased accumulation of these chemicals in all waste streams.

PFAS are found in landfill leachate, wastewater treatment plant (WWTP) effluent and sludge, groundwater, sediments and soils. A 2014 study[3] of PFAS levels across 20 Canadian WWTPs found increased levels of PFAS in water and air around WWTPs. Researchers noted that WWTPs with advanced biological treatment can actually transform the levels of PFAS in the influent into other and more numerous forms of PFAS following biological treatment. The application of sludge containing PFAS to land has resulted in uptake by plants and in a recent case a dairy farmer in Maine was forced to dispose of his milk after it tested high for PFAS contamination.[4]

WWTPs with advanced biological treatment can actually transform the levels of PFAS in the influent into other and more numerous forms of PFAS into the air and effluent following biological treatment.



Key routes of PFAS exposure from treated carpets and rugs.

Source: California Department of Toxic Substances Control

WHY FOCUS ON THE GREAT LAKES - ST. LAWRENCE RIVER ECOSYTEM

There is generally low Canadian public awareness of PFAS contamination and where these substances are found in their communities and in products. There may also be a misperception that all PFAS are now regulated and will no longer be used in Canada.

Although a few long-chain PFAS (PFOS, PFOA, LC-PFCAs) are being regulated and restricted in Canada, there are still exemptions for their ongoing use in firefighting foam and textiles. Also, the majority of the approximately 4,700 different types of PFAS on the market have little to no data on their use, toxicity and chemical structure and are not currently regulated or restricted in Canada. As industry phases out the use of PFOS and PFOA, they are replacing these with other, often shorter-chain, PFAS for use in firefighting foam, carpets, textiles, cosmetics and other industrial and product uses because they are considered to be less toxic. However these shorter-contain molecules are still highly persistent, have little or no environmental and human health data and are more mobile in water than the long chain PFAS, making them harder to treat in groundwater and drinking water.

Long-chain PFAS molecules are highly persistent, bioaccumulative and toxic which is why regulatory and voluntary actions are taking some of them off the market. Industry is now replacing these with shorter-chain PFAS for use in fire-fighting foam, carpets, textiles, cosmetics and other industrial and product uses because they claim to be less toxic. However short-chain PFAS are just as persistent in the environment and are more mobile in water making them even harder to treat in groundwater and drinking water. The increasing use of shorter chain PFAS is resulting in increased exposure to wildlife, children and adults with little or no toxicological data to support industry's claims that they are safe. In the meantime, regulators wait for proof of harm before acting and fail to promote informed substitution to transparently safer PFAS-free alternatives.

According to experts, in the Great Lakes, "the highest levels of PFAS are generally found in areas of Lake Ontario, the western end of Lake Erie and the Detroit River corridor." The highest concentrations of PFCAs in air from across Canada were identified in Toronto.[5] In 2009 Environment Canada noted that large urban areas can act as diffuse sources of PFAS due to their use in industrial processes and consumer products, and recommend that 'management action should focus on prevention of pollutant emissions from consumer and industrial products.'[6]

The use of PFAS in firefighting foam at military bases, airports and refineries is increasingly acknowledged to be a common source of PFAS water contamination. Research on PFAS in Toronto tributaries draining into Lake Ontario from 2007 through 2010 by the Ontario Ministry of Environment and Climate Change found Etobicoke Creek had the highest water concentrations of PFAS consistent with the use and accidental release of firefighting foams containing PFAS at Pearson International Airport.[7] In June 2017 the North Bay Health Unit was notified by the Department of National Defense (DND) that two private drinking water wells in the vicinity of the Canadian Forces Base had levels of PFAS that exceeded Health Canada's drinking water screening values. Affected homeowners were notified and advised not to drink or use the water for cooking purposes; as a result DND supplied water to the affected residents.[8]

PFAS in firefighting foam is increasingly found to be a major cause of water contamination.

Photo credit: International Joint Commission

The Canadian government has published factsheets and updates on the work that the federal government is doing to regulate PFOS, PFOA and LC-PFCAs, but there are no location-specific maps that would help communities identify the monitoring location and results for the presence of these and other PFAS in drinking water or groundwater. In comparison, the Great Lakes US states of Minnesota, Michigan and New York provide a range of public information including online maps of monitoring and contaminated sites, drinking water advisories, point sources of PFAS releases, and actions underway to deal with stockpiles of firefighting foam.

New Canadian Drinking Water Guidelines for PFOS and PFOA are substantially weaker than US based guidelines which present a challenge for bi-national drinking water protection strategies.

In December 2018, Health Canada published Guidelines for Canadian Drinking Water Quality for both PFOA and PFOS. The Canadian government's maximum acceptable concentration (MAC) for PFOS in drinking water is 600 ng/L (0.600 µg/L) and for PFOA it is 200 ng/L (0.200 µg/L). The US Environmental Protection Agency has set a lifetime health advisory of 70 ng/L (0.070 µg/L) and are working to finalize this into law. Many states including Michigan, Minnesota, New Hampshire, New Jersey and Vermont, have drafted even stricter drinking water and groundwater guidelines after conducting their own analysis of limits that would be more protective of public health.

Selected Federal/Provincial/State drinking water and groundwater standards/guidelines for PFOA and PFOS (May 2019)

FEDERAL/ PROVINCE /STATE	DRINKING WATER (DW) GROUND WATER (GW) STANDARD/GUIDANCE	PFOA (µg/L)	PFOS (µg/L)	PROMULGATED RULE (Y,N,O) Y = FINALIZED INTO LAW N = FINAL GUIDANCE O = DRAFT LAW
Health Canada	DW Maximum Acceptable Concentration	0.200	0.600	Y*
Ontario	No standard proposed	---	---	-
Quebec	No standard proposed	---	---	-
British Columbia	DW/GW standard	0.200	0.300	-
US Environmental Protection Agency (EPA)	DW Lifetime health advisory	0.070	0.070	N
Michigan	DW Screening Level DW/GW Generic Screening Criteria	0.009 0.070	0.008 0.070	N Y
New Hampshire	GW Ambient GW Quality Standard	0.070	0.070	Y
New Jersey	DW Maximum Containment Level GW Interim Specific Quality Standard	0.014 0.010	0.013 0.010	O Y
Vermont	DW/GW Health Advisory	0.020	0.020	Y
Minnesota	DW/GW Chronic Health Based Value	0.035	0.015	N/O

Source: ITRC, May 2019 https://pfas-1.itrcweb.org/fact-sheets/

*Health Canada Drinking Water Guideline is not legally binding and it is up to the provinces to adopt, or make more restrictive, and implement.

Health Canada notes that water utilities should sample source water for PFAS, particularly if source waters are impacted by firefighting training areas, military bases, airports, manufacturing sites and/or waste disposal sites, but no public information is available. The Drinking Water guidelines note that conventional treatment is not effective for PFOA or PFOS removal. As of 2019, neither Ontario nor Quebec has legislated provincial drinking water guidelines for any PFAS in the GLSLR Ecosystem.

Remediation technologies to treat PFAS in drinking water and waste streams are costly, ineffective for some PFAS, and not widely used, except for being widely employed in the US where drinking water has been found to be contaminated. In conjunction with identifying the sites that need PFAS remediation, a **more proactive product life cycle approach necessitates a market shift to transparently safer PFAS-free products including firefighting foam, carpets, textiles and food packaging. Safer PFAS-free alternatives are available and are being used by proactive companies for food packaging, clothing, cookware and carpets while PFAS-free firefighting foam is available for use in airports and Class B fires. Firefighters are now a growing voice calling for PFAS-free foam use.**

WHAT WE NEED TO DO IN THE GREAT LAKES – ST. LAWRENCE RIVER ECOSYSTEM

Some regulatory bodies and company leaders in the US and internationally have already set goals to eliminate the entire class of PFAS in products. A strong bi-national citizens' effort and community outreach is now required with Canadians taking action to:

1. Phase out the entire class of PFAS beyond the PFOS, PFOA, LC-PFCAs
2. Strengthen GLSLR programs and agreements, particularly the Canada-Ontario Agreement and the Chemicals of Mutual Concern under the GLWQA, to target PFAS as a class and adopt informed substitution strategies to move the market to transparently safer PFAS-free products and processes.
3. Strengthen Canadian drinking water standards to be more protective of children's health and promote binational community and regulatory best practice that will eliminate PFAS contamination.
4. Increase Canadian public access to information and reporting about PFAS in products, firefighting foam, industrial discharges, and sludge as well as drinking water and groundwater sampling results.

ENDNOTES

[1] Health Canada. Second Report on Human Biomonitoring of Environmental Chemicals in Canada. 2013.

[2] Health Canada. ibid

[3] Hanna Hamid, Loretta Y. Li. Role of wastewater treatment plant in environmental cycling of poly- and perfluoroalkyl substances. Ecocycles (2016) DOI: 10.19040/

[4] Bangor Daily News. https://bangordailynews.com/2019/03/23/news/york/maine-dairy-farm-plagued-by-chemical-contaminants-may-be-tip-of-the-toxic-iceberg/

[5] Great Lakes Water Quality Identification Task Team draft document. Binational Summary Report: Perfluorinated Chemicals (PFOS, PFOA and Long Chain PFCAs) Accessed 12/2/2019 https://binational.net/wp-content/uploads/2015/05/EN-PFCs-Binational-Summary-Report-Final-Draft.pdf

[6] Environment Canada. Perfluoroalkyl Compounds in Sediments of Tributaries and Open-Water Areas of the Great Lakes. 2009

[7] Great Lakes Water Quality Agreement Identification Task Team draft document. Op cit. See 5

[8] North Bay Parry Sound Health Unit https://www.myhealthunit.ca/en/health-topics/perfluoroalkylated-substances-pfas.asp

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