

Contaminants of Emerging Concern (CECs) in Fish:

Perfluorinated Compounds (PFCs)

About PFCs

Perfluorinated compounds (PFCs) are a class of synthetic compounds containing thousands of chemicals formed from carbon chains with fluorine attached to these chains. Perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS) are two of the best known PFCs. The chemical structure of PFCs gives them unique properties, such as thermal stability and the ability to repel both water and oil, that make them useful components in a wide variety of consumer and industrial products, including non-stick cookware, food packaging, waterproof clothing, fabric stain protectors, lubricants, paints, and firefighting foams. Large volumes of PFCs have been produced since the 1950s. Their high production volume led to widespread distribution in the environment, particularly in water where they are most readily transported. EPA initiated a program in 2006 to phase out emissions and use of long-chain perfluorinated chemicals (including PFOA) by the end of 2015 because these chemicals are persistent, bioaccumulative, and toxic.

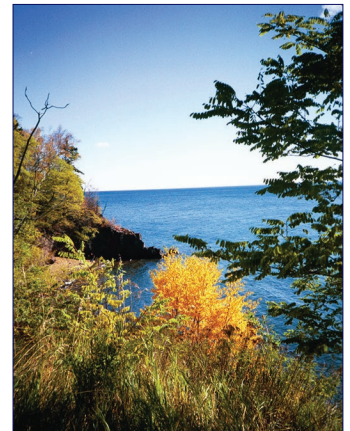
Why Is Studying PFCs in Fish Important?

Since 2000, PFCs have emerged as contaminants of concern because they are broadly distributed and persistent in the environment. The vast majority of people living in industrialized nations have detectable concentrations of many PFCs in their blood serum. Elevated concentrations of PFOS and PFOA in human blood have been linked to a number of potential health effects, including immunotoxicity, decreased sperm count, low birth weight, thyroid disease, and high cholesterol (PFOA only). PFCs have also been associated with endocrine disruption and cancer in animal studies. Recent modeling studies estimate that PFC contamination in food may account for more than 90% of human exposure to PFOS and PFOA, with results from other studies suggesting that fish from contaminated waters may be the primary source of exposure to PFOS.

How Is EPA Responding?

Based on potential health risks to people exposed to PFOS in fish, the EPA identified the need for a more comprehensive characterization of PFC contamination in U.S. fish. As a result, EPA planned and conducted a national-scale study of urban rivers and a regional-scale study of the Great Lakes to evaluate the extent of PFC contamination in freshwater fish. The purpose of the studies is to develop national and regional estimates of the median concentrations of PFCs in fish from U.S. rivers and the Great Lakes, respectively. The statistical design of the studies also allows for estimation of the percentage of river miles or nearshore lake area with fish tissue concentrations above a specified human health threshold. EPA established partnerships to conduct the following studies:

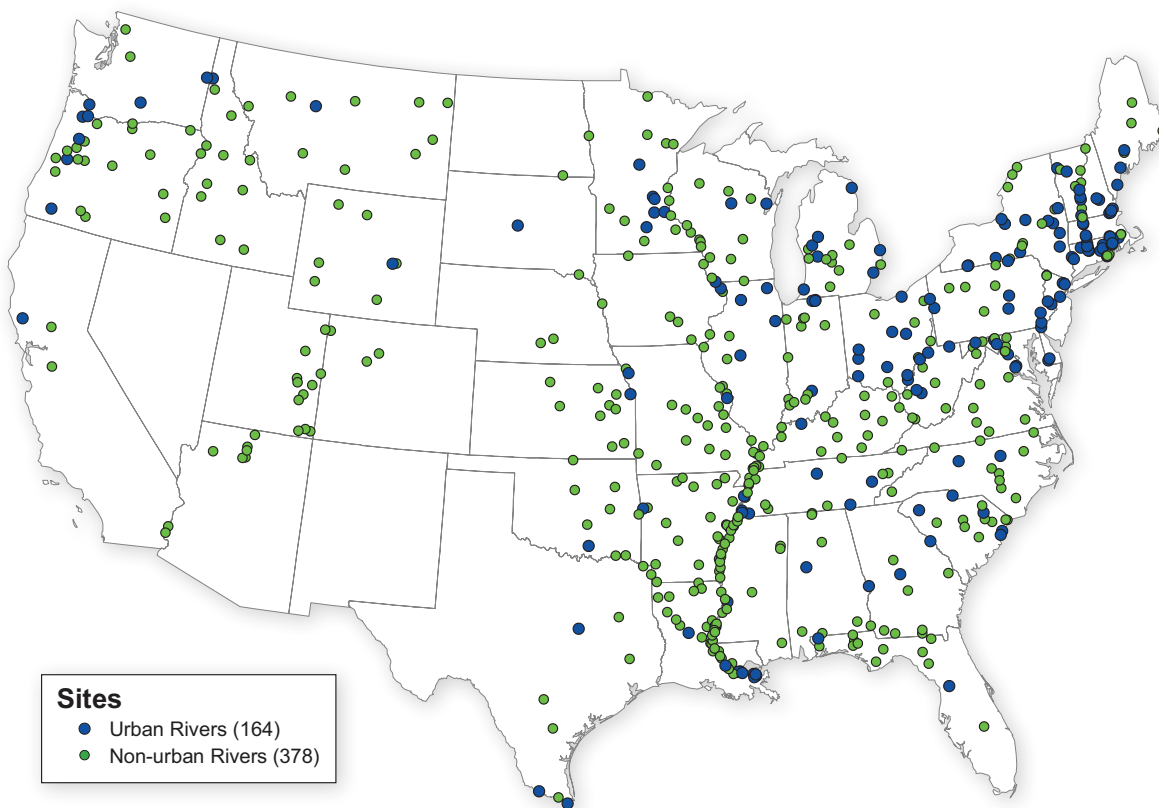
- The National Rivers and Streams Assessment (2008–2014)
- National Coastal Condition Assessment, Great Lakes Human Health Fish Tissue Study (2010–2014)



National Rivers and Streams Assessment CEC and Legacy Fish Tissue Contamination Studies

First statistically based national assessment of contaminants in fish from U.S. rivers

NRSA Fish Sampling Locations (542)



Study Design

- 164 randomly selected urban river segments sampled in the lower 48 states during 2008 and 2009
- Five fish collected per site to form one composite sample for fillet analysis because people typically consume fillets
- Fillets analyzed for 13 PFCs (e.g., PFOS and PFOA)
- Fillet results for other CECs (musks) from the 164 urban river sites
- Additional fillet results for PBDEs and legacy contaminants (mercury, selenium, PCBs, and pesticides) from the full set of 542 river sites sampled for fish

Future PFC
Milestones

2013

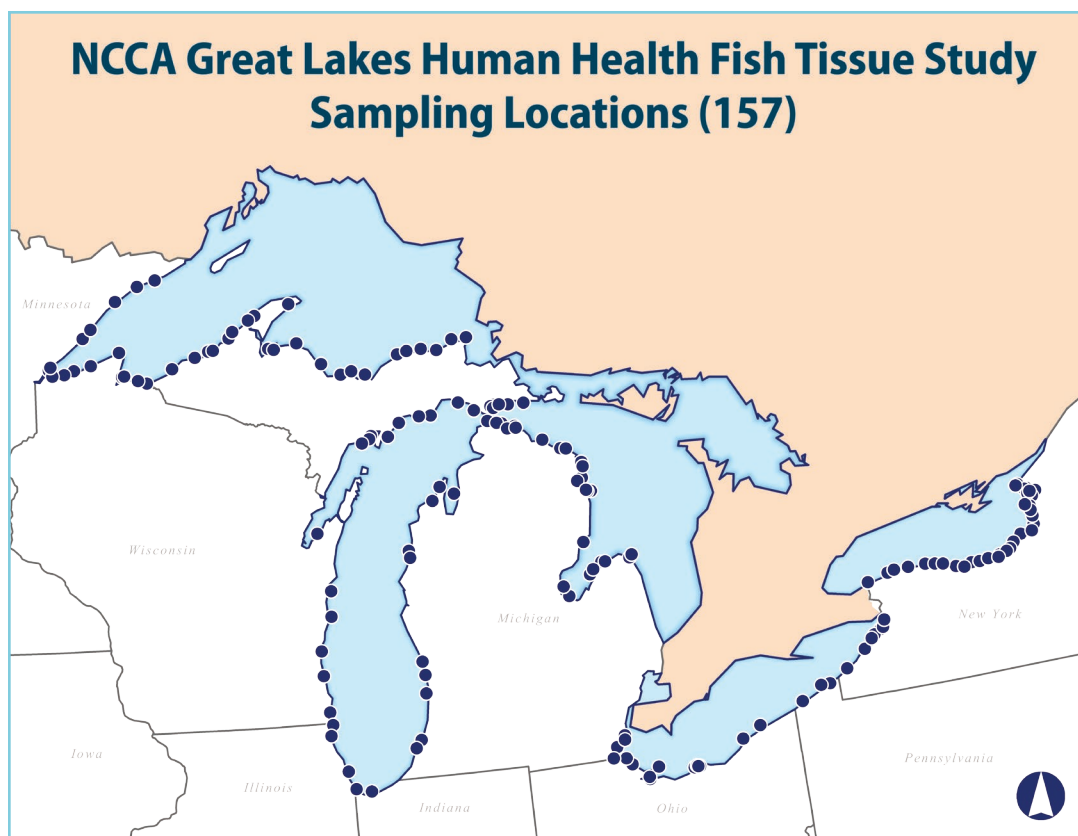
2014

Report
PFC
Results



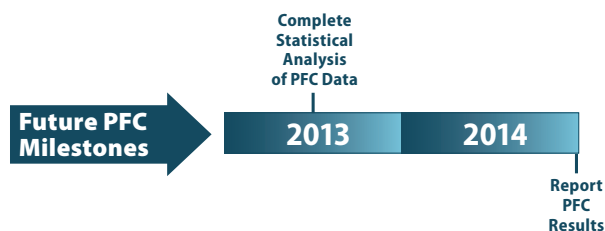
National Coastal Condition Assessment Great Lakes Human Health Fish Tissue Study

**First statistically based assessment of chemicals in Great Lakes fish
relevant to human health**



Study Design

- 157 randomly selected nearshore sites sampled in the 5 Great Lakes (about 30 sites per lake) during 2010
- One fish sample collected per site for fillet analysis
- Fillets analyzed for 13 PFCs
- Fillet results for other CECs (PBDEs), mercury, and PCBs
- First broad assessment of fatty acids in Great Lakes fish



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or access <http://water.epa.gov/scitech/swguidance/fishstudies/>