# Abstract

**Perfluorinated Compounds in Fish from U.S. Urban Rivers and the Great Lakes**

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Perfluorinated compounds (PFCs) have recently received scientific and regulatory attention due to their broad environmental distribution, persistence, bioaccumulative potential, and toxicity. Some studies suggest that the consumption of fish from contaminated waters may be a major source of human exposure to perfluorooctane sulfonate (PFOS) or other long-chain perfluorocarboxylic acids. Much of the existing PFC fish tissue literature focuses on marine fish species and on fish collected outside of the continental U.S. To broaden the assessment of PFCs in U.S. fish, a comprehensive characterization of PFC contamination in freshwater fish was initiated on a national scale during the U.S. EPA 2008-2009 National Rivers and Streams Assessment and during the Great Lakes Human Health Fish Tissue Study component of the 2010 EPA National Coastal Condition Assessment (NCCA/GL). National estimates were developed for PFCs in fish from urban rivers and regional estimates for fish in the U.S. Great Lakes using an unequal probability design. Fish were collected from a statistically representative set of 164 urban river sites and from 157 randomly selected nearshore sites in the U.S. throughout the five Great Lakes. The probability design allowed extrapolation to the sampled population of 17,059 km in urban rivers and a nearshore area of 11,091 $km^2$ in the Great Lakes. Fish fillet tissue was analyzed for 13 PFCs using high-performance liquid chromatography tandem mass spectrometry and results were reported in ng/g (or ppb) wet weight. For both the NRSA and NCCA/GL, frequency of PFC occurrence in fillets was dominated by PFOS, followed by three other longer-chain PFCs (PFDA, PFUnA, and PFDoA). Maximum PFOS concentrations were 127 and 80 ppb in urban river samples and Great Lakes samples, respectively. The range of PFOS detections from the NRSA was similar to literature accounts for fillets from targeted riverine fish sampling, but was lower than samples from known industrial areas of PFC contamination. The NCCA/GL PFOS levels were generally higher than values in targeted studies of other inland lakes, but lower than those reported by some other Great Lakes researchers. The probability design of both the NRSA and NCCA/GL resulted in the development of cumulative distribution functions to quantify PFOS concentrations versus cumulative length of urban rivers and nearshore area of the Great Lakes from the sampled population. Application of fish consumption advisory guidance to the national cumulative distributions allowed an estimation of the proportion of the sampled population of urban rivers and the Great Lakes that exceed human health protection thresholds.