

Contaminants of Emerging Concern (CECs) in Fish:

Pharmaceuticals and Personal Care Products (PPCPs)

About PPCPs

Pharmaceuticals and personal care products (PPCPs) are a diverse group of chemicals that include all drugs (both prescription and over-the-counter medications) and non-medicinal consumer chemicals, such as the fragrances (musks) in lotions and soaps and the ultraviolet filters in sunscreens. PPCPs have only recently received attention as potential environmental pollutants. Results from studies in the past several years provide evidence that many PPCPs enter aquatic systems because they persist through wastewater treatment processes and are subsequently discharged from wastewater treatment plants into surface water or groundwater. New developments in technology have led to improvements in detecting and quantifying PPCPs in water, sediments, and fish tissue. However, despite recent advances in PPCP research, the full extent, magnitude and consequences of their presence in aquatic environments are still largely unknown.

Why Is Studying PPCPs in Fish Important?

PPCPs are persistent in aquatic environments due to their continual release from discharges of treated and untreated wastewater. By the mid-2000s, there were increasing reports of the occurrence of PPCPs in surface waters and sediments, but data on their accumulation in fish tissue were scarce. Available data suggest that effects of these chemicals may be subtle because PPCPs generally occur at low concentrations in the environment, but these subtle effects may accumulate and become significant. Current concerns associated with PPCP contamination include increases in resistance to antibiotics and endocrine system disruption.

How Is EPA Responding?

In 2006, EPA responded to the PPCP data gap by initiating a pilot study to investigate the occurrence of PPCPs in fish tissue. This was the first screening study of PPCPs in fish from a variety of locations distributed across the country. Based on results from the pilot study, EPA expanded its effort to characterize PPCP contamination in U.S. fish by planning and conducting a national-scale study of fish from urban rivers under EPA's National Rivers and Streams Assessment. The urban river study generated data on concentrations of musks in fillets from freshwater fish. Musks are fragrances added to personal care products, such as soaps and lotions. EPA established partnerships to conduct the following studies:

- National Pilot Study of PPCPs in Fish Tissue (2006–2009)
- National Rivers and Streams Assessment (2008–2014)



National Pilot Study of PPCPs in Fish Tissue (PPCP Fish Pilot Study)

First broad screening-level study of PPCPs in U.S. fish

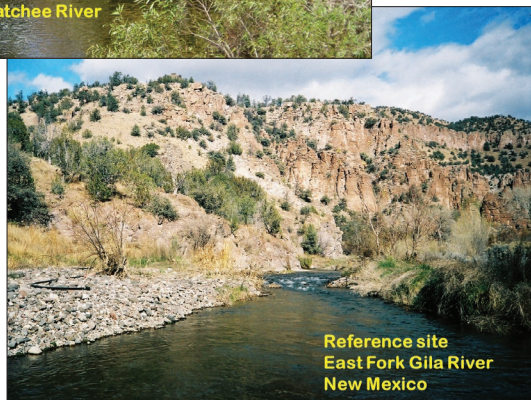
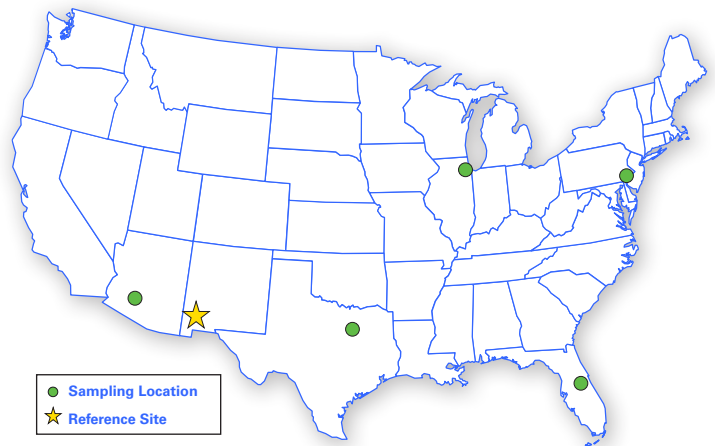
PPCP Fish Pilot Study Design

Design Elements	Pharmaceuticals	Personal Care Products
Number of Sites	5 Effluent-dominated streams + 1 reference site	
Site Selection	Targeted	Targeted
Sampling Period	2006	2006
Fish Samples/Site	6	6
Fish Tissue Samples	Fillets and Livers	Fillets only
Chemical Analysis	24	12
Total Samples Analyzed	72	36

PPCP Results

- Seven of the 24 pharmaceuticals and two of the 12 personal care product chemicals were detected in the fish tissue samples; antihistamines, antidepressants, and musks were the most prevalent PPCPs.
- Most pharmaceuticals occurred at concentrations in the low parts per billion (ppb), while the musks commonly occurred at concentrations in the low parts per million (ppm).
- Fewer PPCPs were detected in fish from discharge areas where facilities apply advanced wastewater treatment technologies, such as ozonation.

PPCP Fish Tissue Pilot Study Sampling Locations



Publications

- **PPCP Fish Pilot Study Article** (Environmental Toxicology and Chemistry, 2009)
- **National Pilot Study of PPCPs in Fish Tissue** (Final Report, 2013)

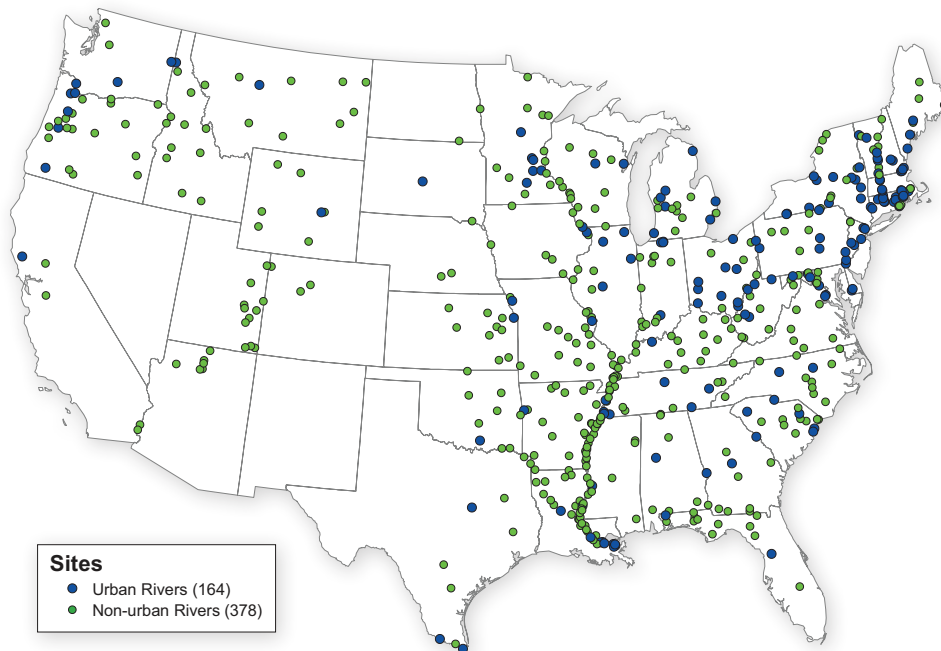
Collaborators with EPA

- Baylor University Center for Reservoir and Aquatic Systems Research
- Metropolitan Water Reclamation District of Greater Chicago
- New Mexico Environment Department

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 6 musks
- Fillet results for other CECs (PFCs) 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



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