

Improve the Understanding & Coordination of Science Activities for PFAS in the Chesapeake Watershed

May 17, 2022



PFAS in Surface Water, Sediment and Fish from the Delaware River Basin

Ron MacGillivray, Ph.D.

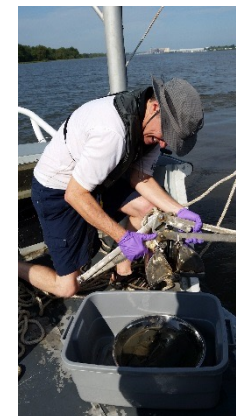
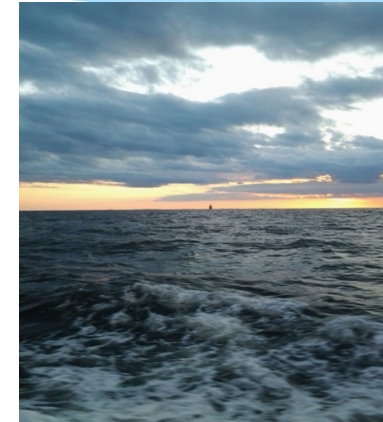
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Presented to Chesapeake Bay Program's (CBP) Scientific and Technical Advisory Committee (STAC)



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Delaware River Basin Commission



The 1937 Philadelphia Record editorial page cartoon depicted polluted Delaware River

A unified approach to managing, protecting and improving shared water resources with five equal members:

- Delaware
- New Jersey
- Pennsylvania
- New York
- Federal Government



River of the Year for 2020
“The Delaware River is a national success story,” Bob Irvin, President and CEO of American Rivers

Why are PFAS of Concern?



Occurrence, Persistence, Bioaccumulation and Toxicity

What are the risks to source water, fish consumption, maintenance and propagation of fish, other aquatic life, and aquatic dependent wildlife?

Effects on Human Health

Association with liver damage, increased cholesterol, thyroid disease, decreased response to vaccines, asthma, decreased fertility and birth weight, pregnancy-induced hypertension

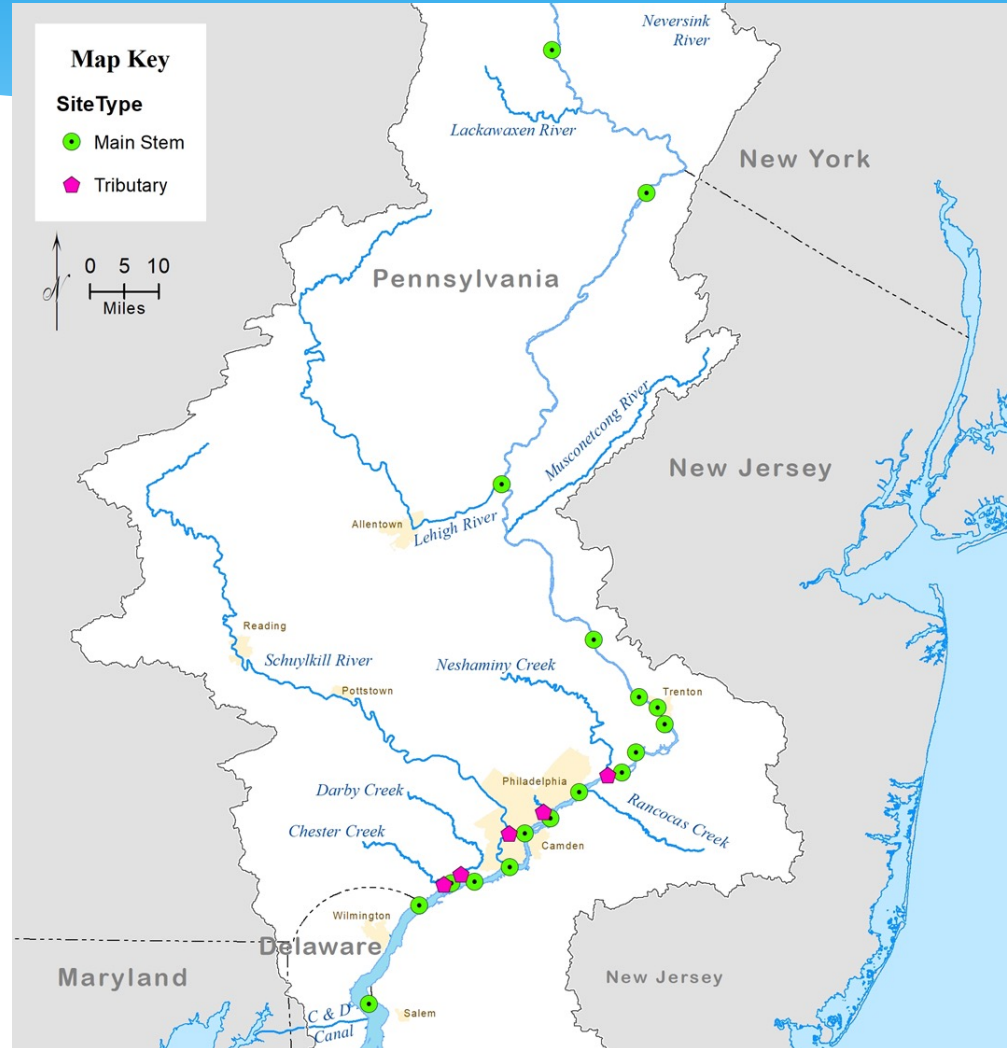
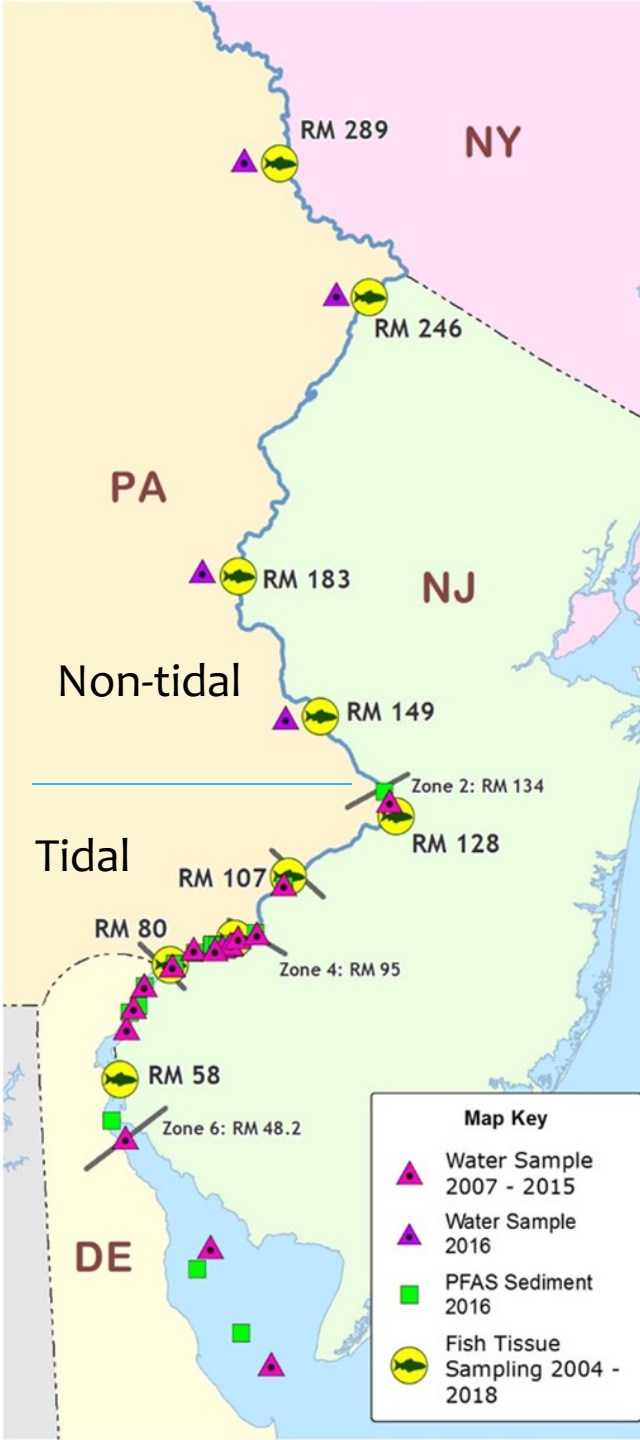
Effects on Aquatic Life

Impaired survival, growth, and reproduction, other sublethal affects observed.

Direct exposure (water column)

Indirect exposure (bioconcentrated by producers and bioaccumulated by consumers in higher trophic levels)

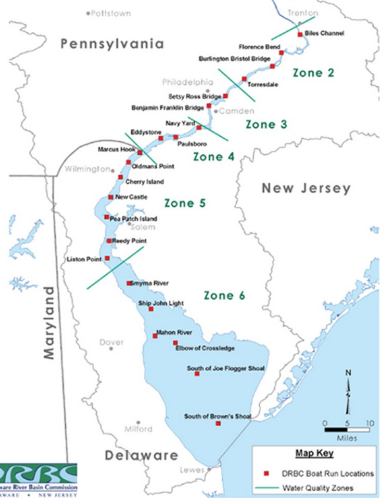
Delaware River Sampling Sites and Years



Analytical Method



- * Draft EPA Method 1633 equivalent
- * 40 PFAS are currently analyzed in fish fillet (2g wet), surface water (1L) and surficial sediment (5g dry) by SGS AXYS Analytical Services Ltd. (Sidney, B.C., Canada).
- * Analytical methods included Solid Phase Extraction (SPE) with weak anion exchange sorbent cartridges and LC-MS/MS with isotope dilution.

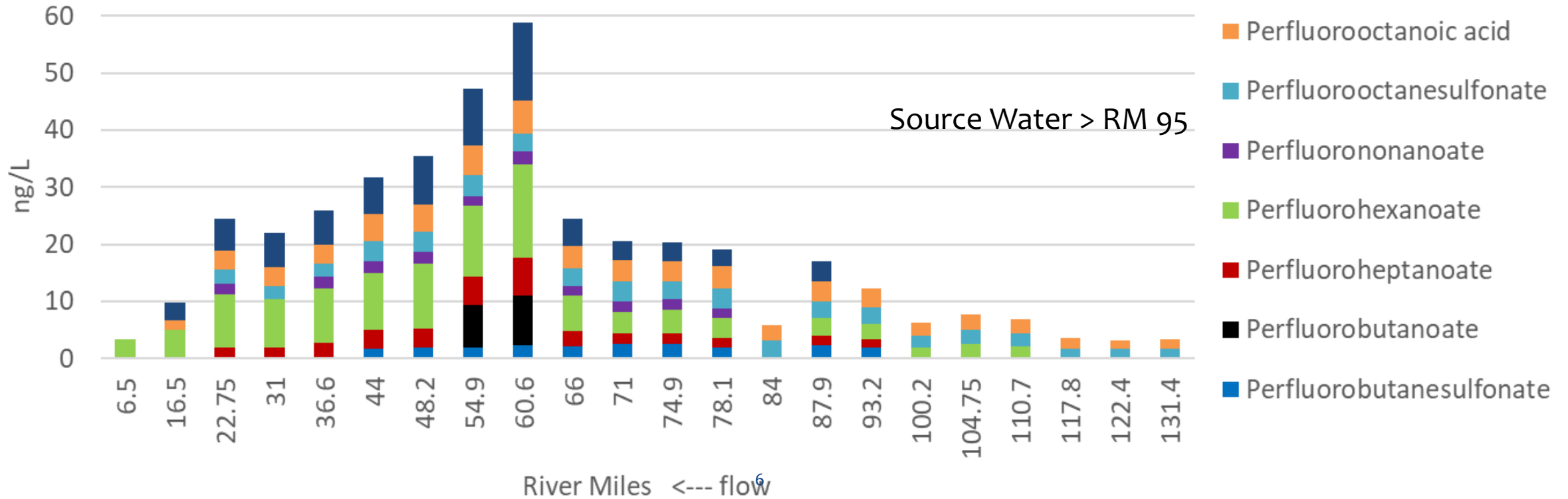


Occurrence in Midchannel of Tidal Mainstem River

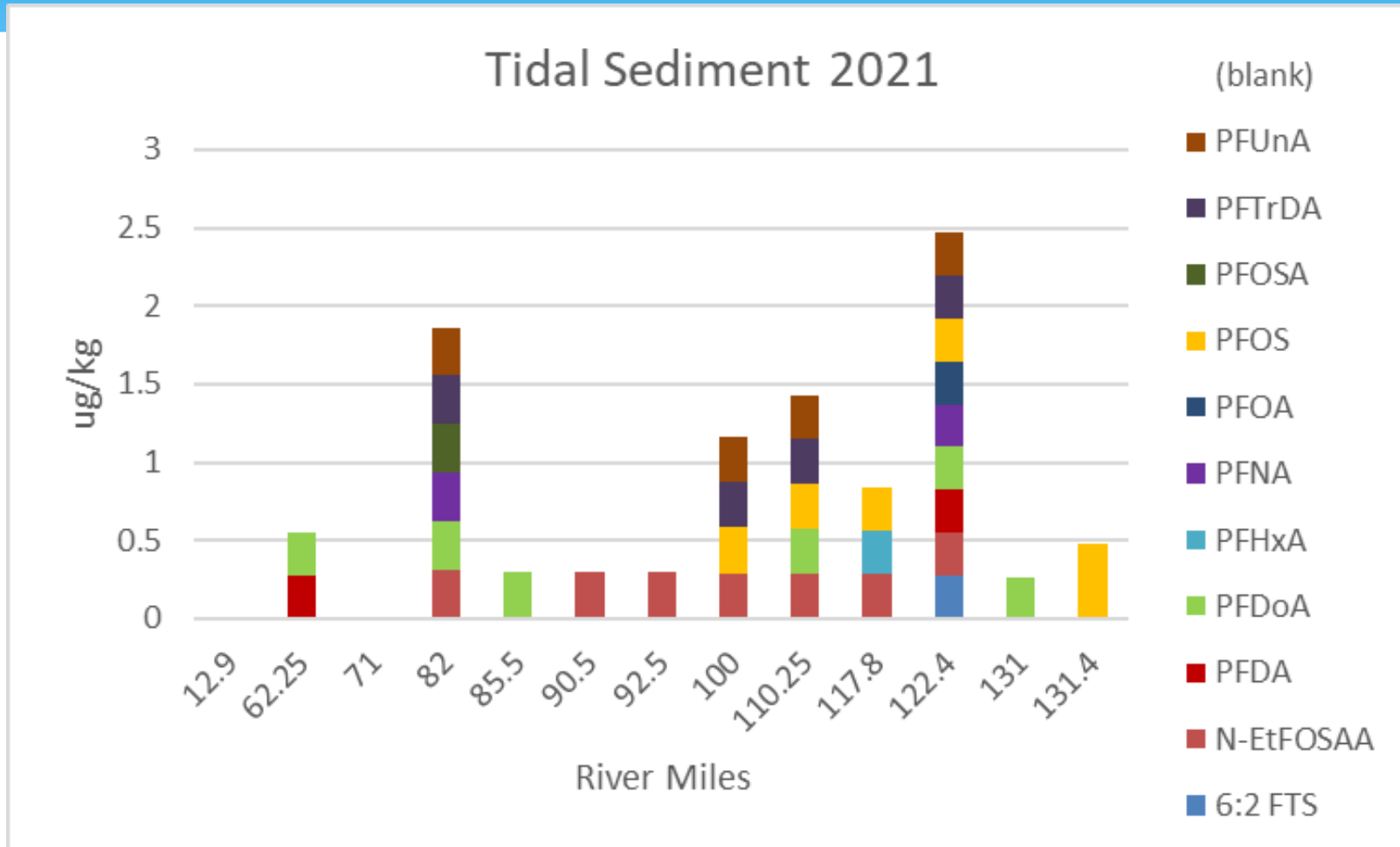


Surface Water Sept 20, 2021
14,000 cfs Rising Tide

Source Water > RM 95

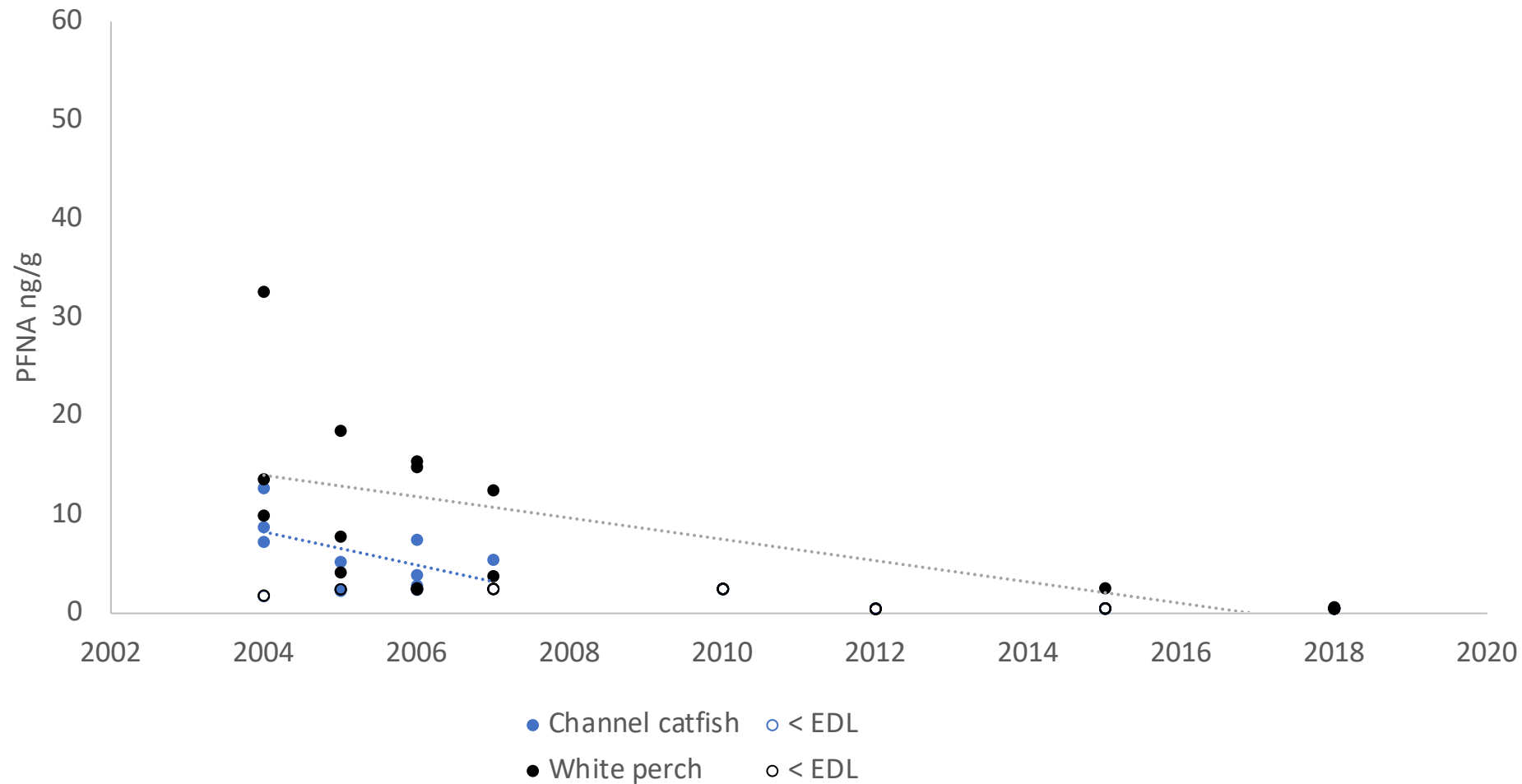


Longer Chain PFAS in Mainstem of Delaware River

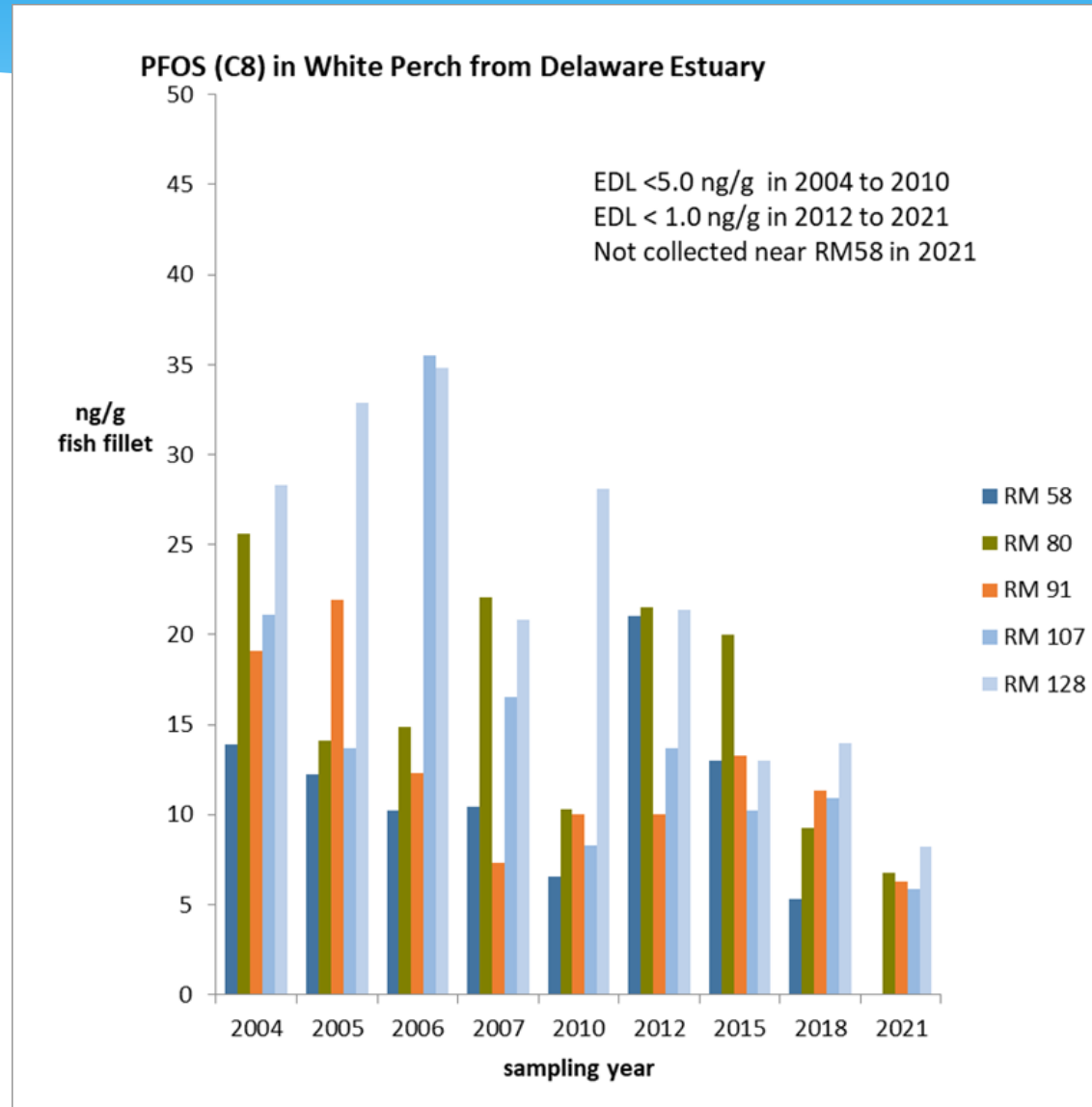


RM 12.9 and 71 NA

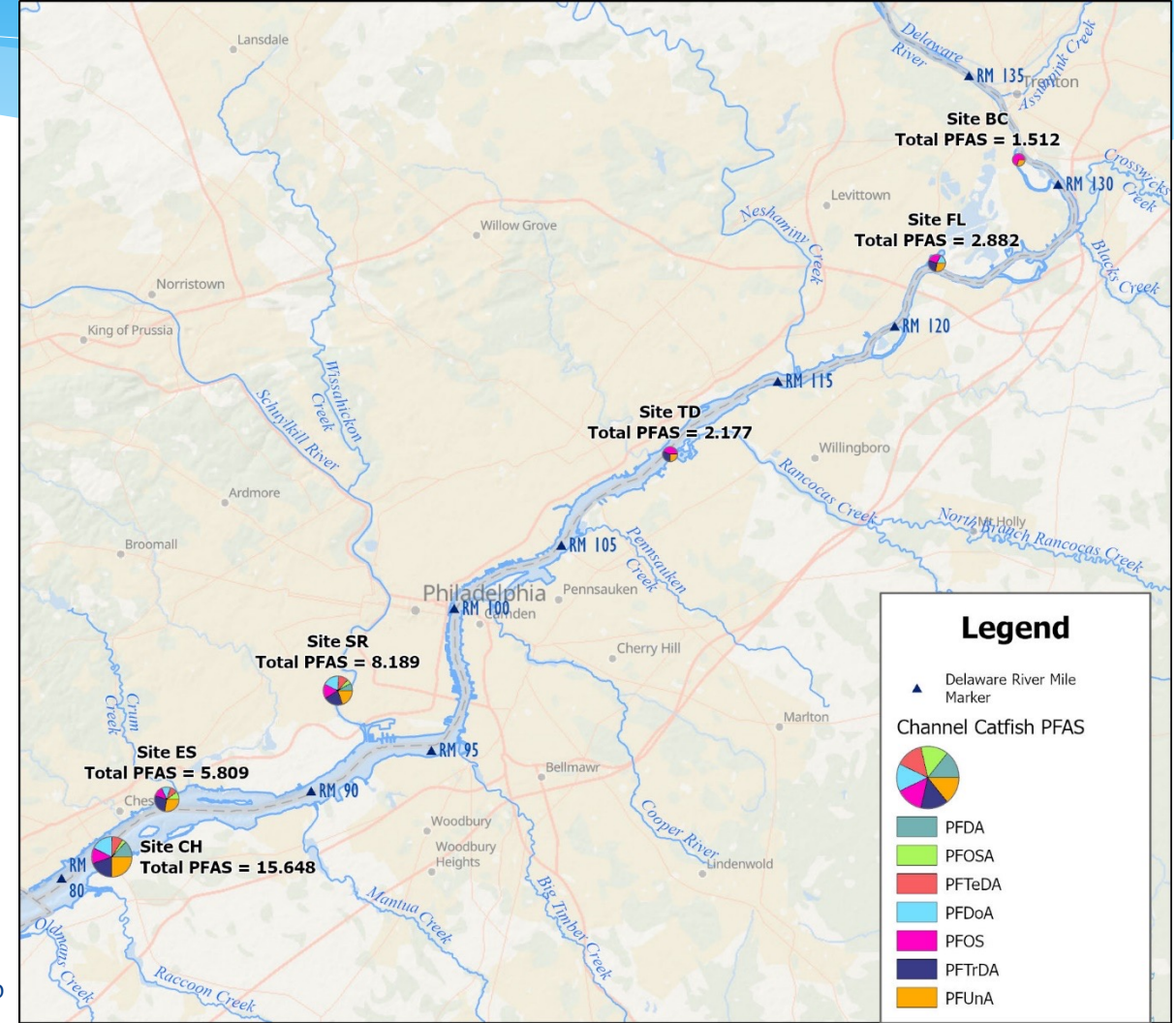
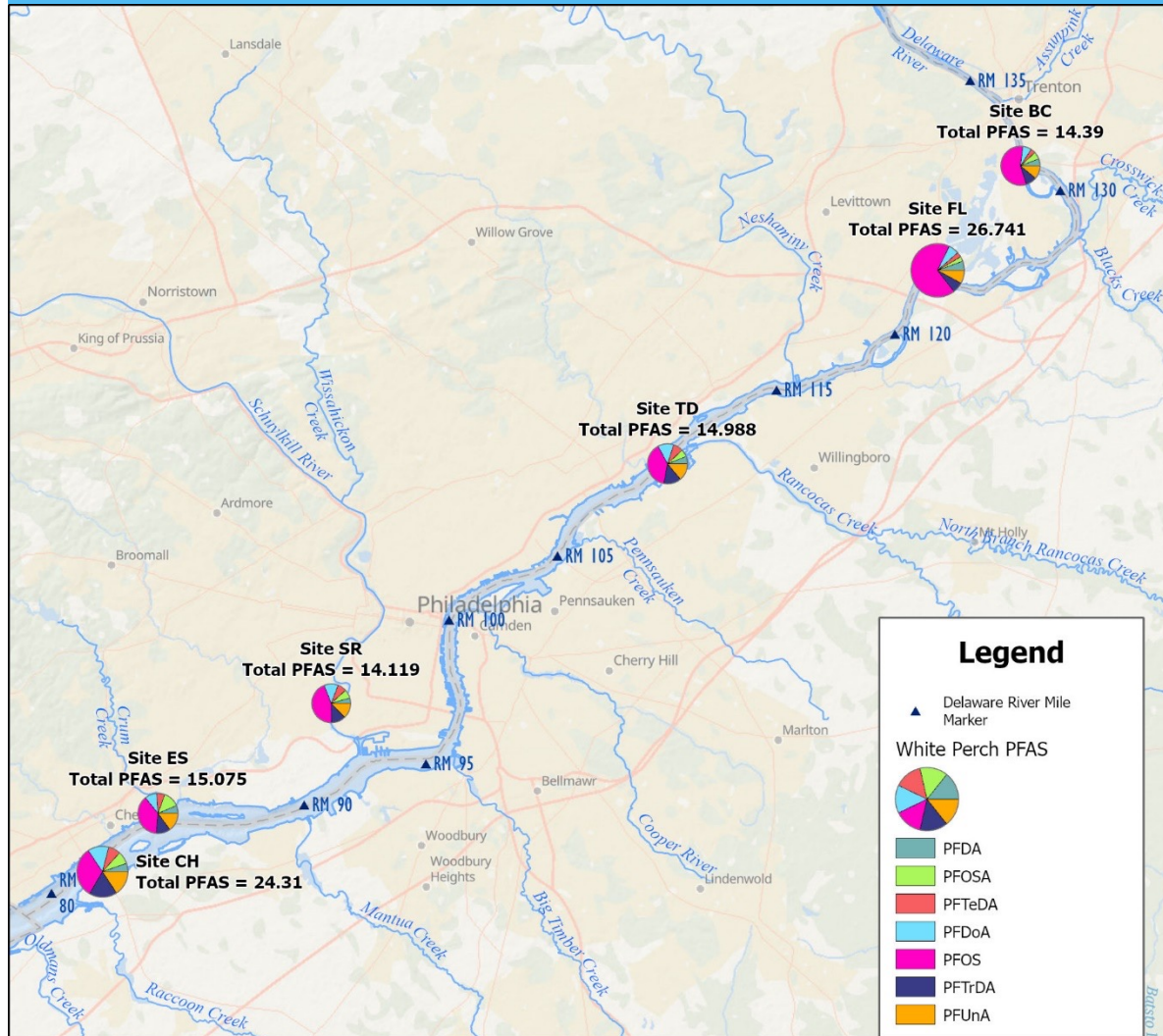
Temporal Trends in Fish Fillet - PFNA



Temporal Trends in Fish Fillet - PFOS



2021 PFAS Fish Fillet (ng/g) : Spatial



Delaware River Summary



- In main stem, PFAS are below regional and national guidelines in areas designated as drinking water sources.
- Sediment contain long-chain PFAS at low concentrations.
- Significant decreases in PFNA and PFUnA concentrations in fish over the sample period.
 - PFOS concentrations slowly decreasing.
- Levels of PFAS in fish indicate further evaluation of risk to human health and aquatic dependent wildlife is warranted.
 - Legacy and novel PFAS are of concern.

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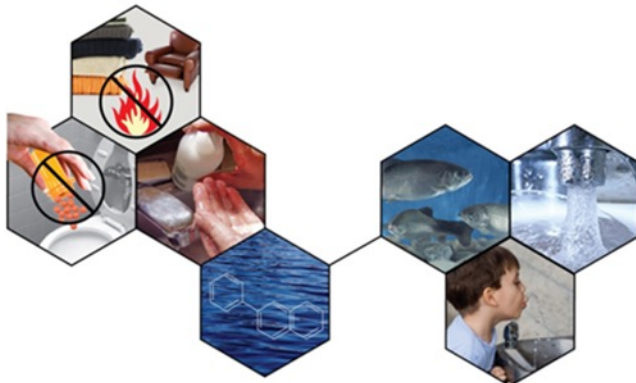
<https://www.nj.gov/drbc/programs/quality/cecs.html>

MacGillivray, A R (2021) Temporal trends of PFAS in Delaware River Fish, USA. Integrated Environmental Assessment and Management. 17(2) 411-421.

<https://setac.onlinelibrary.wiley.com/doi/10.1002/ieam.4342>



*Managing, Protecting and
Improving Our Shared
Water Resources since
1961*



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