Monitoring for Historical and Emerging Contaminants in Resident Fish in the Delaware River

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Delaware River Basin Commission
DELAWARE · NEW JERSEY
PENNSYLVANIA · NEW YORK
UNITED STATES OF AMERICA

Presentation Themes

- ✓ Background
  - Issues with monitoring contaminants in fish
- ✓ Program Details
  - Sampling Design
  - Analytical Methods
  - 2004-2006 Results
- ✓ Summary

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Monitoring Fish Contaminants

- Issues:
  1. Why monitor fish?
  2. Interstate waters.
  3. Funding for programs.
  4. Design considerations:
     - Locations
     - Species?
     - Analytical parameters
  5. Coordination w/ State partners.

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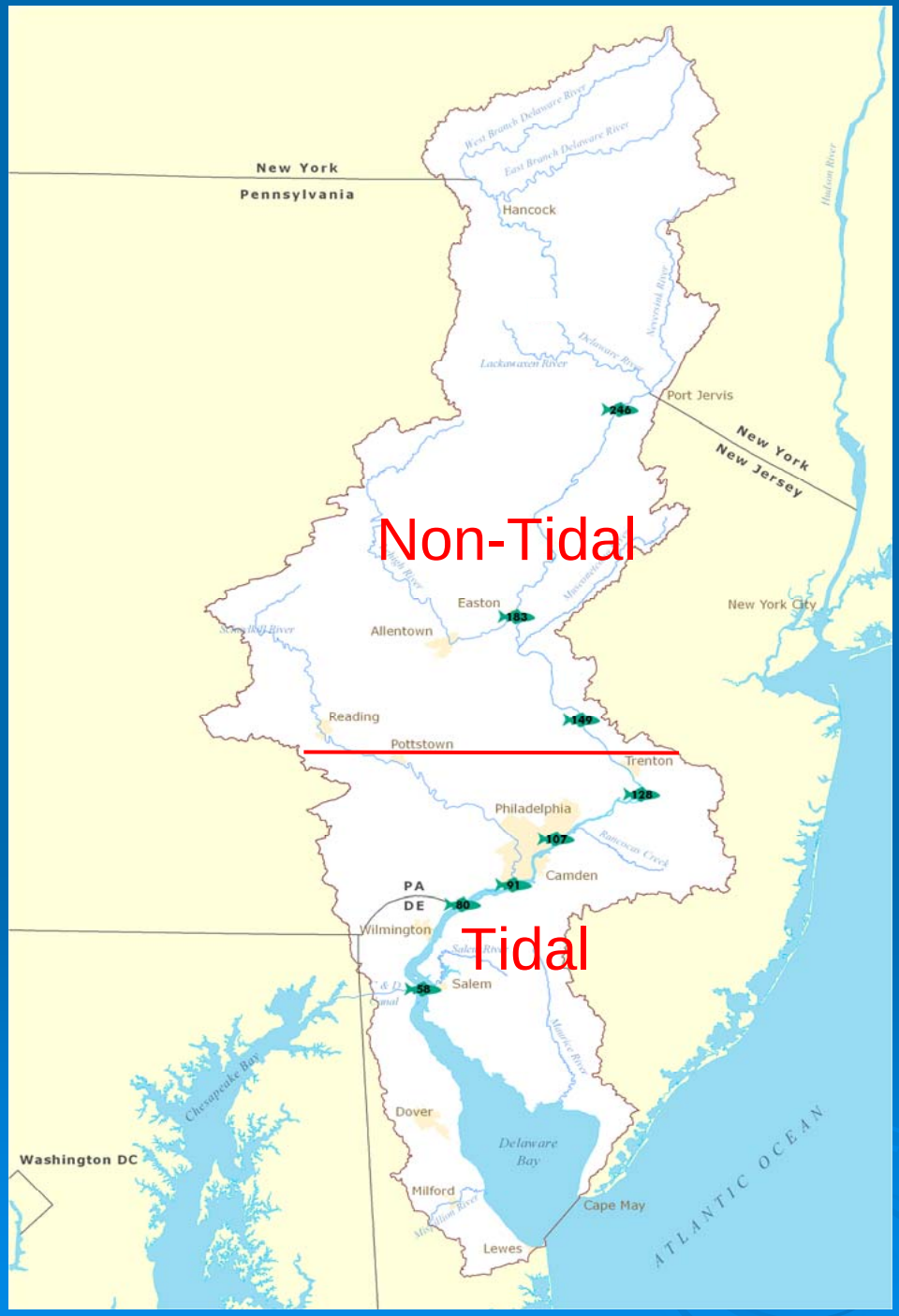
Sampling Design

- Fish samples were collected from 8 stations in both the tidal and non-tidal portion of the Delaware River.
  - Tidal Program – conducted since 1991.
  - Non-tidal Program - conducted since 2000.
- Two species of fish are collected at each site representing resident benthic and pelagic trophic levels.
  - Tidal species: white perch, channel catfish
  - Non-tidal species: smallmouth bass, white sucker
- Samples are collected by electrofishing or hook & line, and consist of 4 to 5 fish of similar size and weight.



Sampling Locations 2004 - 2006

Non-Tidal Locations

Milford, PA	RM 246
Easton, PA	RM 183
Lambertville, NJ	RM 149

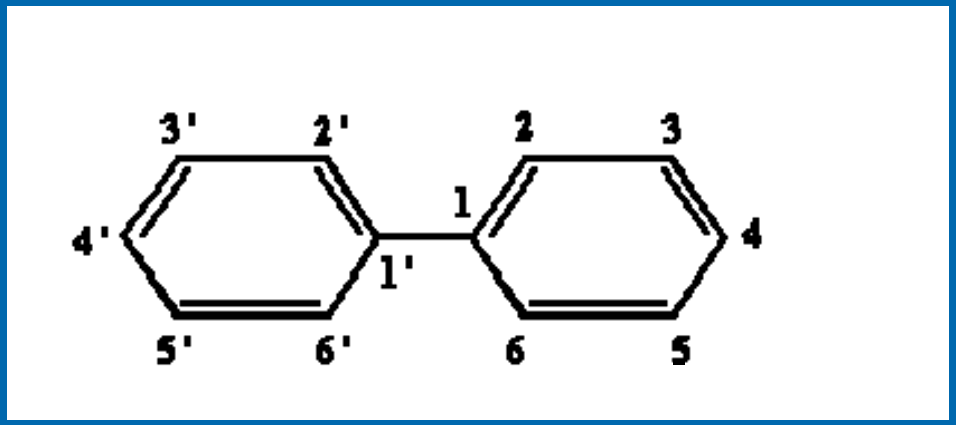
Tidal Locations

Crosswicks Creek	RM 128
Tacony-Palymra Br.	RM 107
Woodbury Creek	RM 91
Raccoon Creek	RM 80
Salem River	RM 58

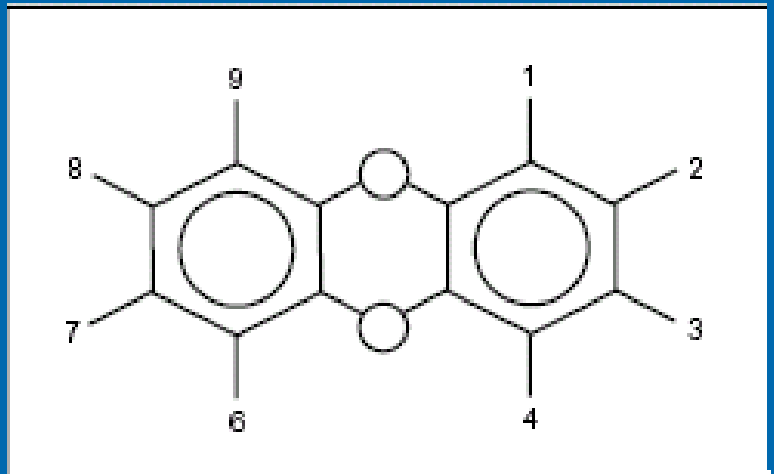
Analytical Methods

- Samples composites of standard fillets.
- Analytical Parameters & Methods:
  - PCBs- all 209 congeners using Method 1668, Revision A: HRGC/HRMS
  - Dioxin/Furans- 17 compounds using Method 1613B HRGC/MS
  - PBDEs- 46 congeners using Method 1614 HRGC/ LRMS
  - PFOA/PFOS- 13 compounds using Method LC/MS/MS

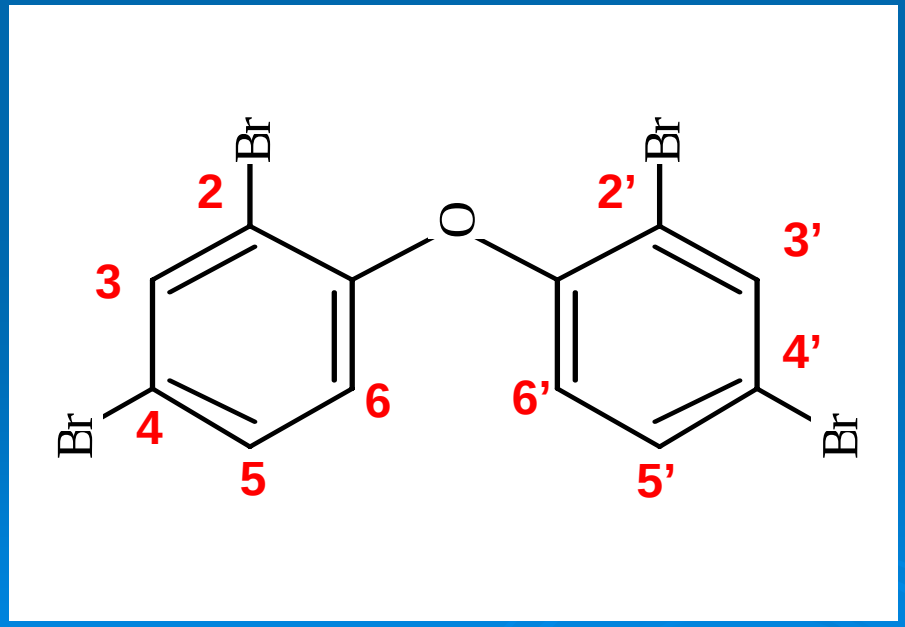
Structure



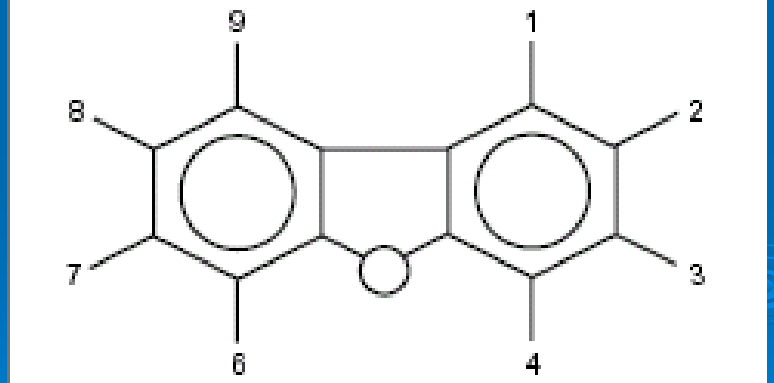
Polychlorinated Biphenyl



Polychlorinated dibenzodioxins



Polybrominated Diphenyl Ethers



Polychlorinated dibenzofurans

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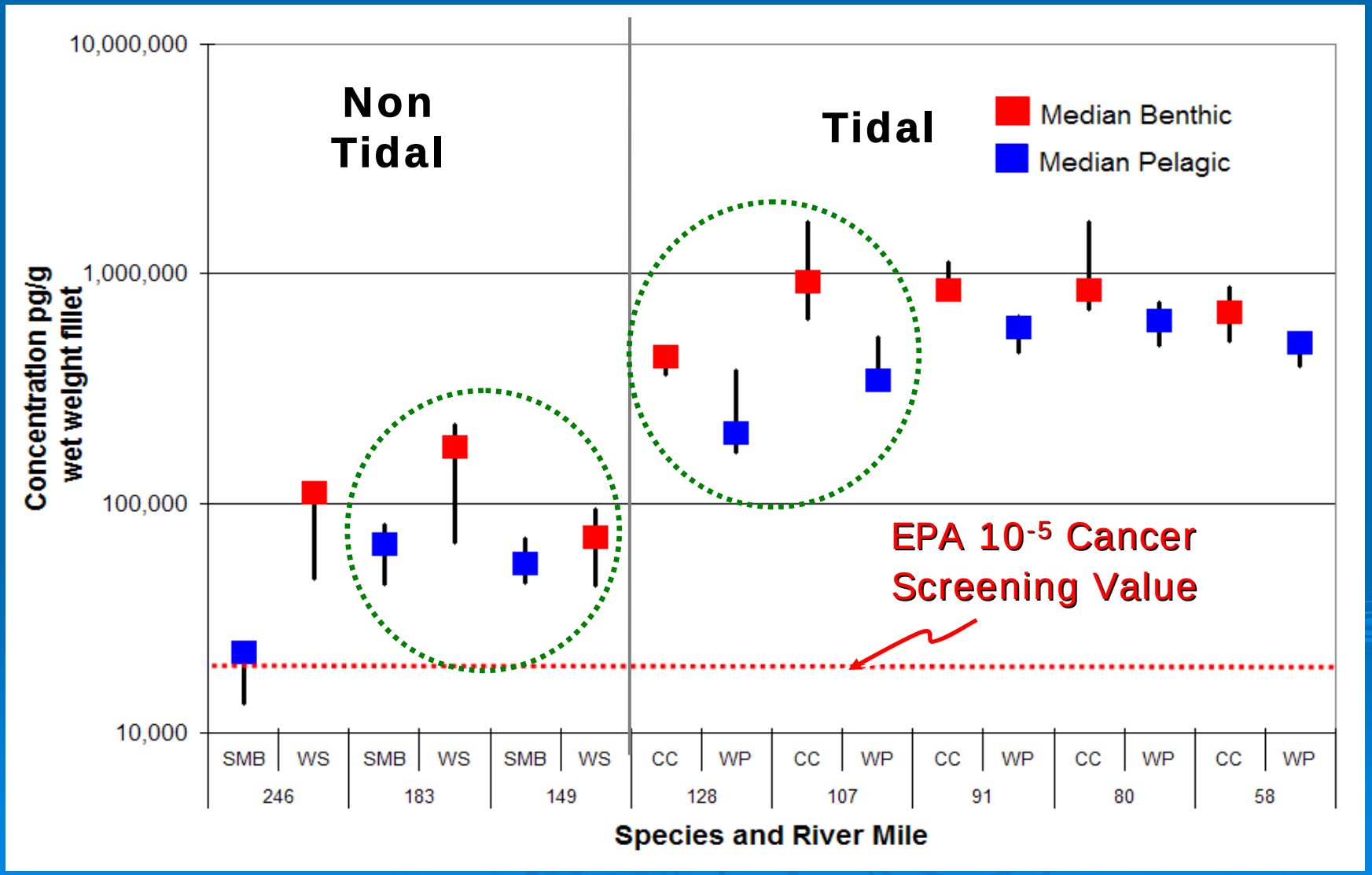
Total PCBs

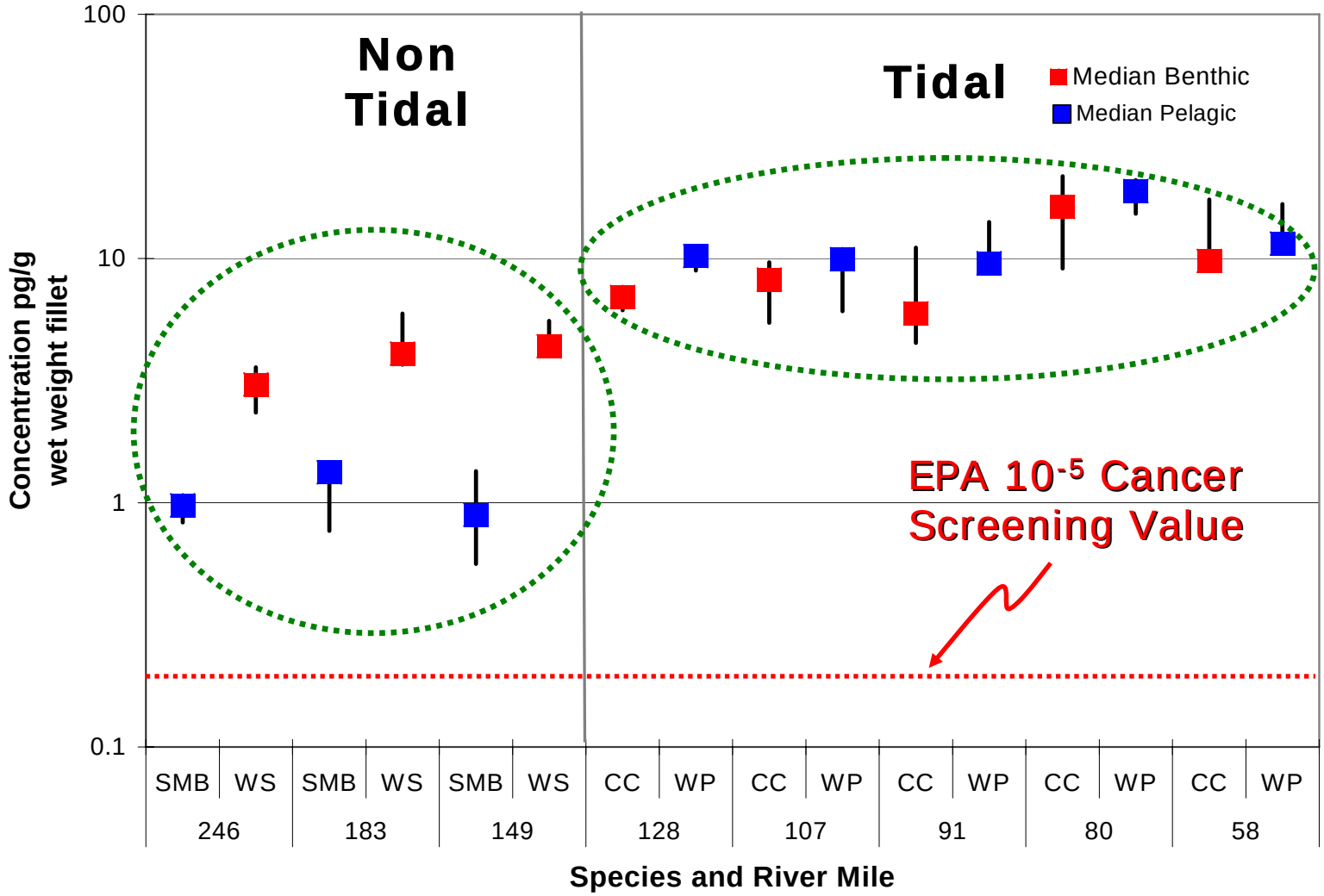
2004-2006 (n=3), 209 congeners



Dioxin/Furans

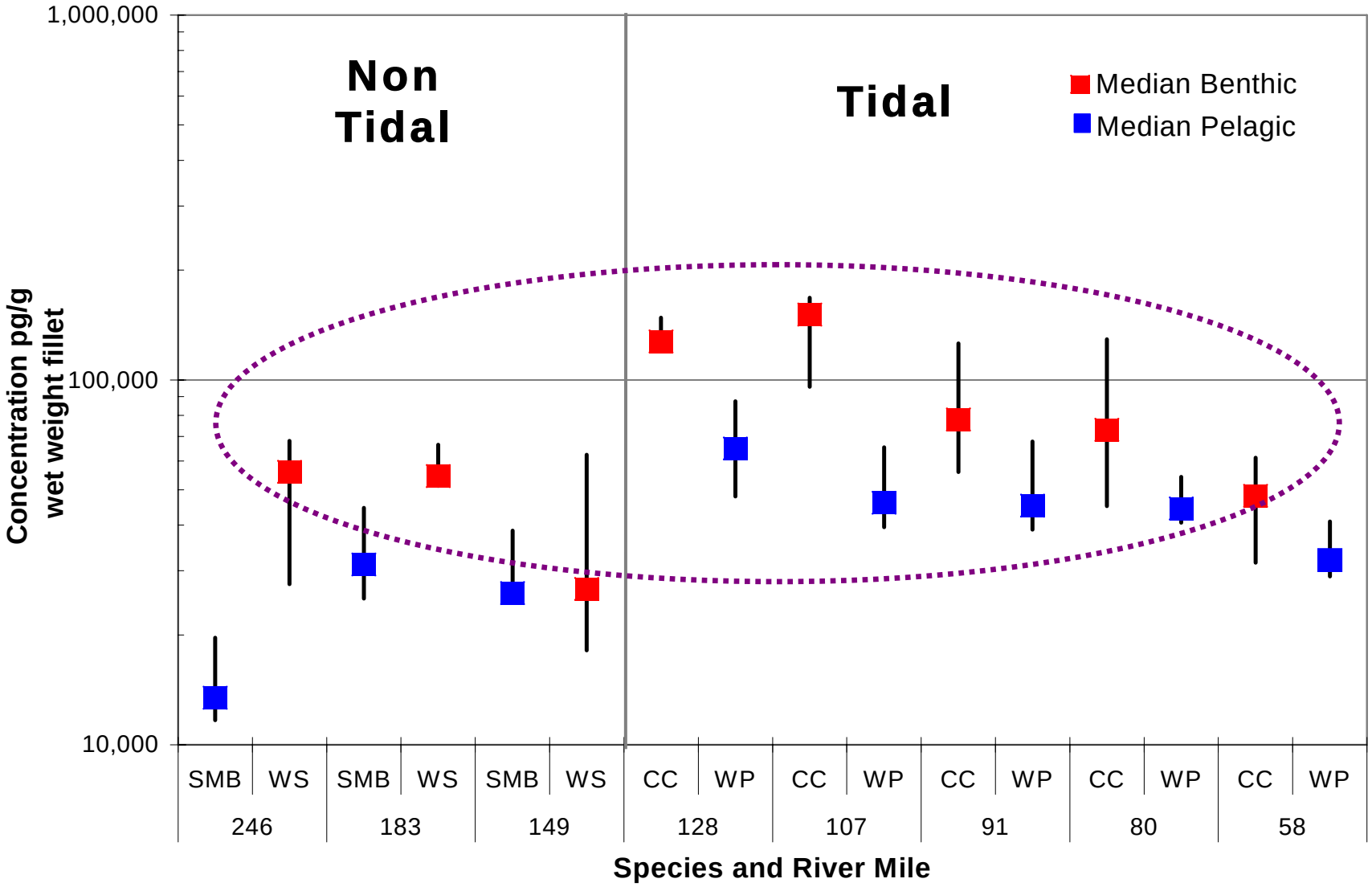
2004-2006 (n=3)

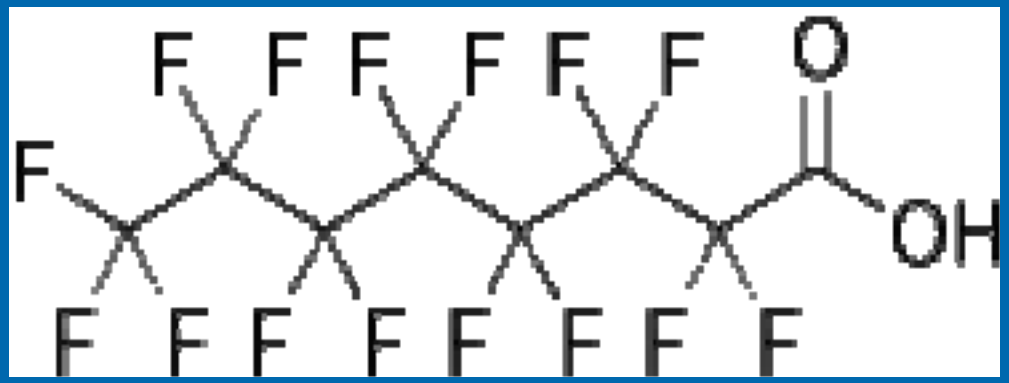
Sum of tetra, penta, hexa, hepta and octa homologs



PBDE Data

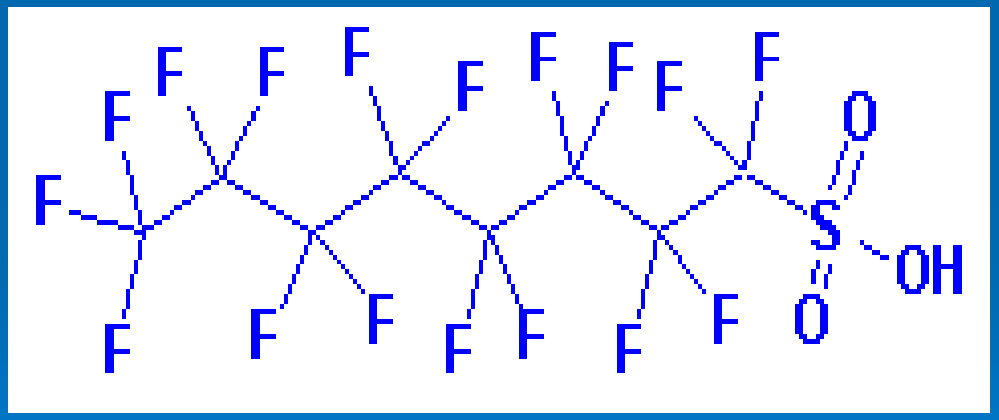
2004-2006, (n=3) for 46 congeners





Perfluorooctanoic Acid (C8)

(PFOA)

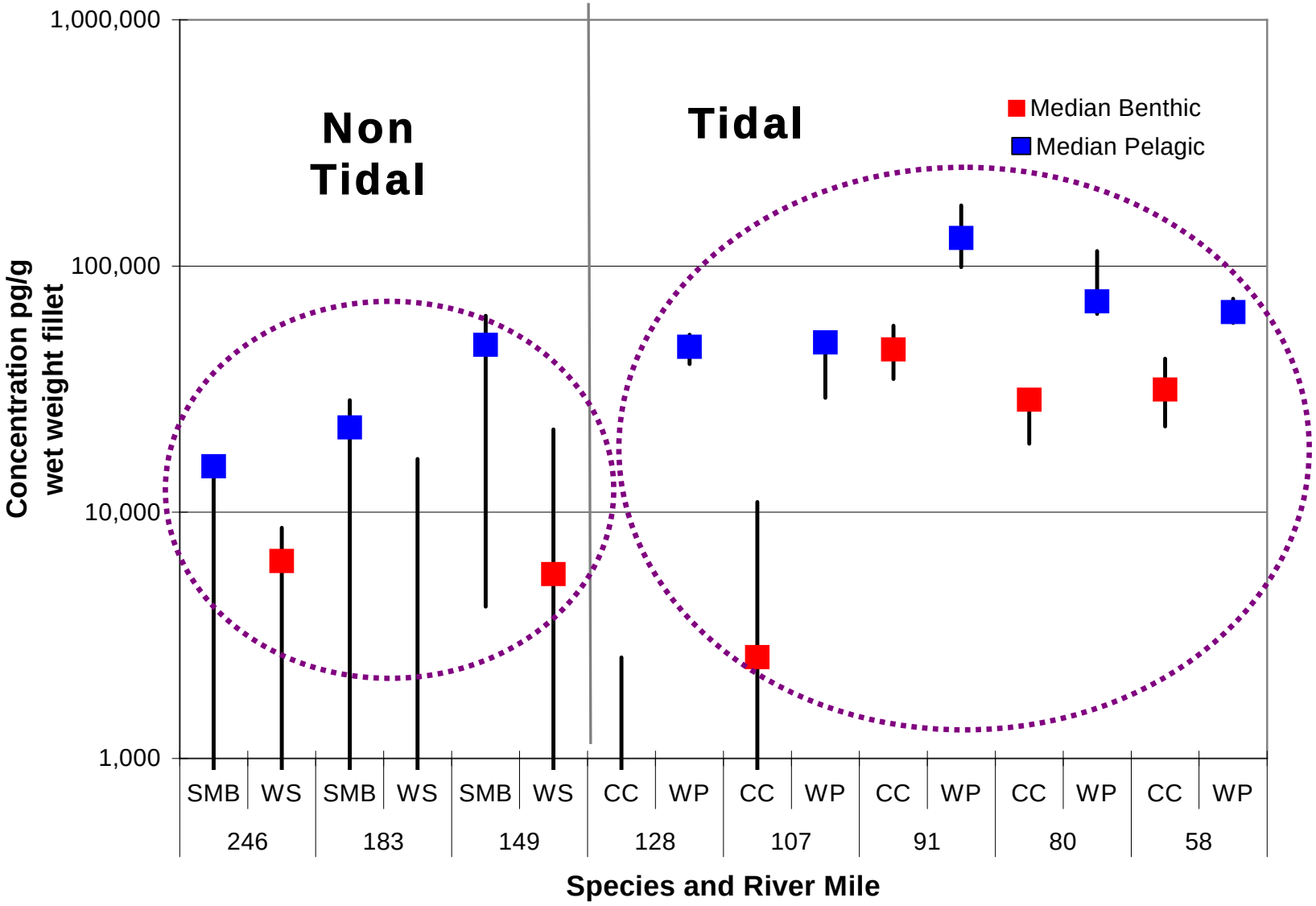


Perfluorooctane Sulfonate

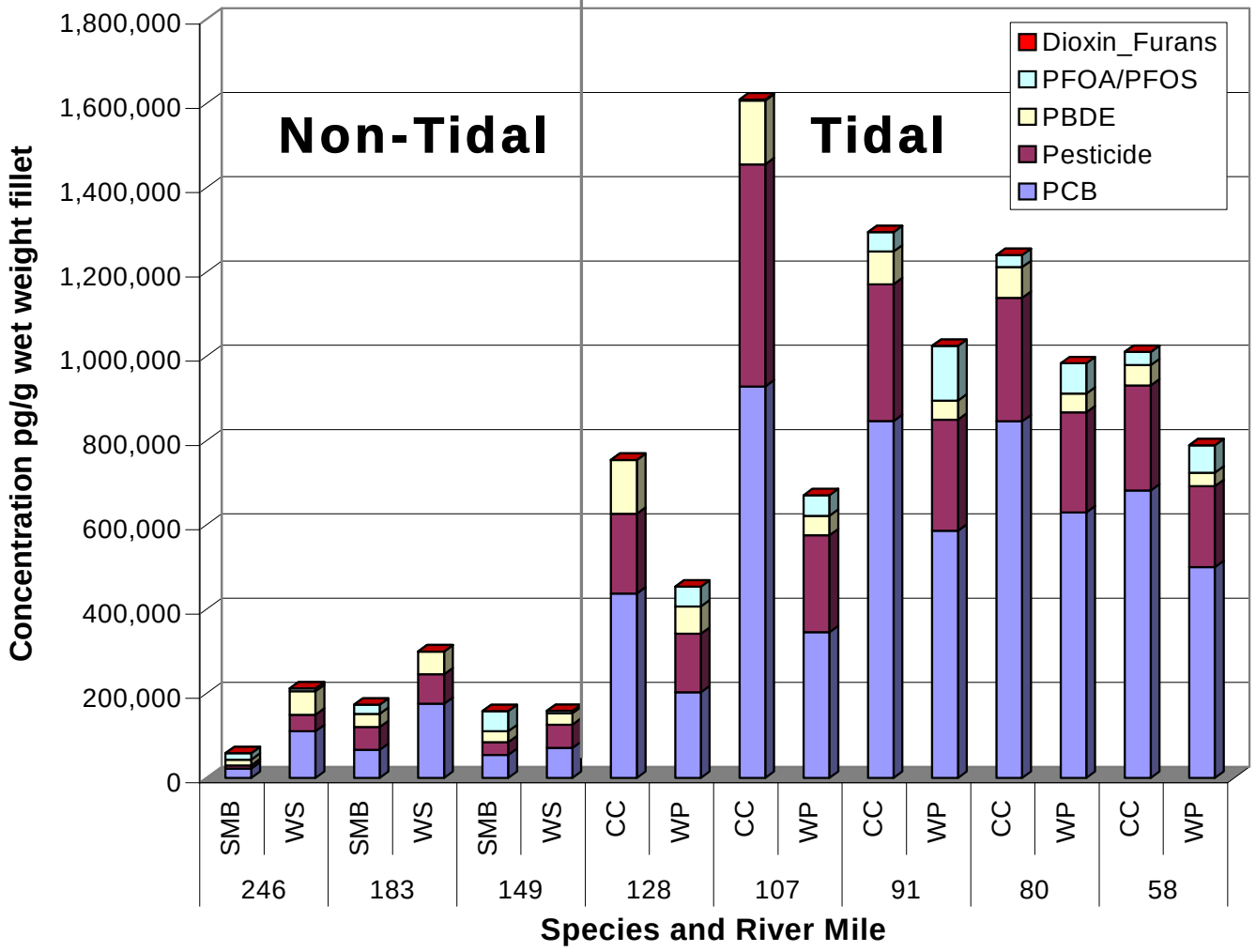
(PFOS)

Combined PFOA/PFOS Data

2004-2006 (n=3) for 13 congeners



Sum of Bioaccumulative Contaminants



Summary

- Fish are excellent integrators of exposure to organic and inorganic contaminants in water bodies, and directly relate to exposure of humans populations through consumption of recreationally-caught species.
- Compared to water monitoring programs, fish monitoring programs are frequently underfunded or sporadically funded resulting in limited spatial and species coverage.
- The DRBC initiated sampling in the interstate portions of the mainstem Delaware River to provide data for impairment assessments and the issuance of consumption advisories.
- The existence of an ongoing monitoring program provided the opportunity to evaluate emerging contaminants.

Summary (cont.)

- Contaminant concentrations in fish collected in less urbanized (non-tidal) portions of the Delaware River are significantly less than those in fish collected from urban (tidal) areas.
- PCBs - All fish samples exceed EPA's 10^{-5} Cancer screening value of 20,000 pg/g.
- PCB concentrations are more elevated in the benthic species compared to the pelagic species.
- Dioxin/Furans (DxFs) – All fish samples exceed exceed EPA's 10^{-5} Cancer screening value of 0.256 pg/g.

Summary (cont.)

- Dioxin/Furans concentrations are more elevated in the benthic fish than in the pelagic fish in the non-tidal zone. However, more elevated concentrations of dioxin/furans occur in the pelagic fish in the tidal portion of the estuary.
- PBDE concentrations are more elevated in the benthic species compared to the pelagic species.
- PFOA/PFOS concentrations are more elevated in the pelagic species compared to the benthic species.
- Differences in contaminant concentrations within the Delaware River watershed imply local sources of these pollutants.
- Strategies for identifying sources and reducing their pollutant loads can be tailored for specific areas, and targeted to reduce the severity of consumption advice.

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