PFCs in Fish Tissue in the Delaware River

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

2009 National Forum on Contaminants in Fish

Portland, OR
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Presentation Themes

- ✓ Background
  - Delaware River Basin
  - Program objectives
  - Why sample for PFCs?
- ✓ Program Details
  - Sampling Design
  - Analytical Methods
  - 2004-2007 Results
    - Background levels
- ✓ Summary

Basin Facts

- Largest un-dammed river east of the Mississippi – 330 miles
- 13,539 square mile drainage
- 17 million water users
- 216 tributaries
- Three reaches included in National Wild and Scenic River System
- One of the world's largest freshwater tidal estuaries
- Delaware Bay- 782 sq. miles

Background

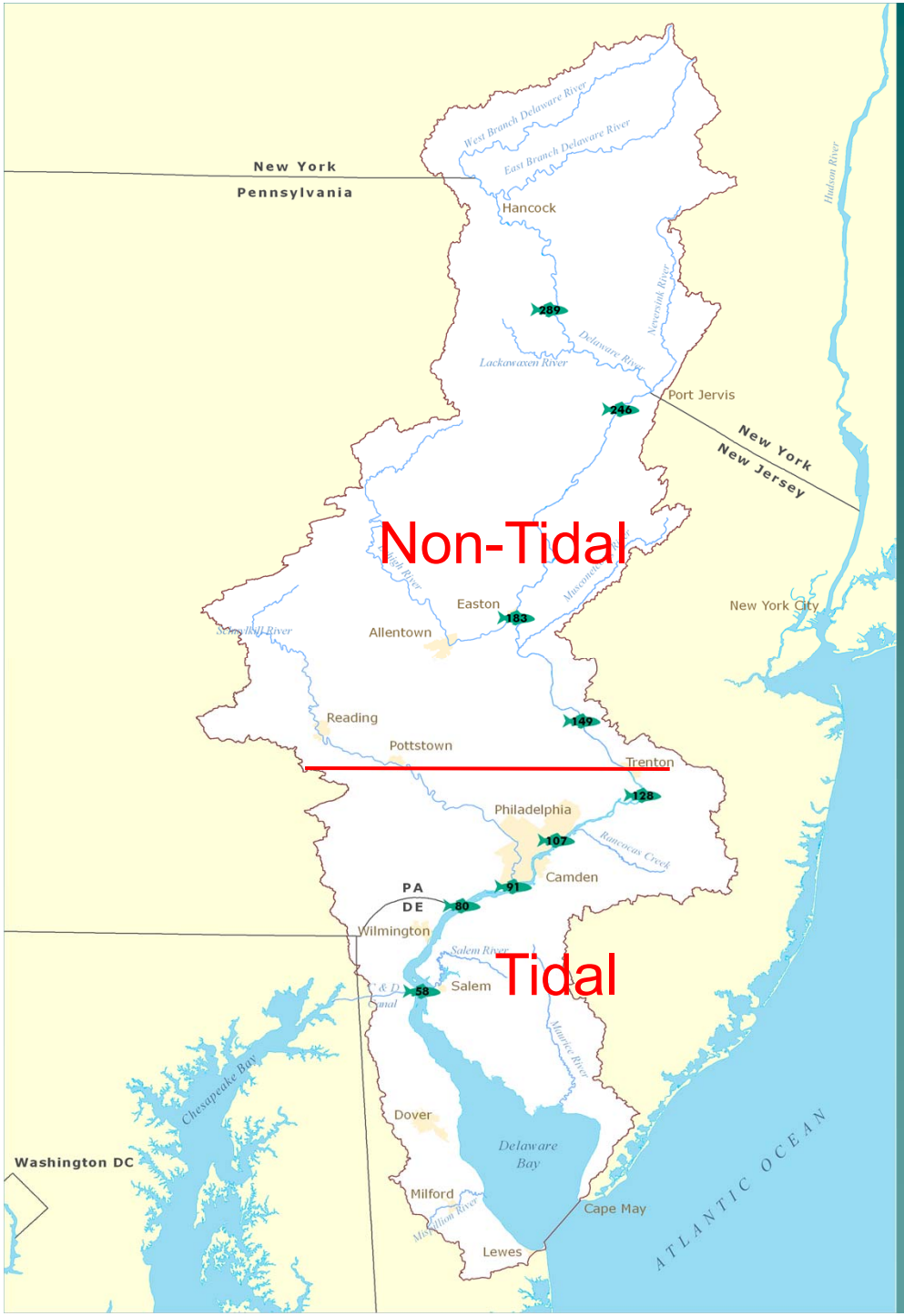
- Issues:
  1. Why monitor fish?
     - Interstate waters
     - Funding for programs
     - Coordination w/ State partners.
  2. Design considerations:
     - Locations – tidal vs. nontidal?
     - Species – resident or migratory?
     - Analytical parameters
  3. Why monitor for PFCs?

Sampling Design

- Historically, water quality near the urban areas surrounding Philadelphia was severely degraded with dissolved oxygen conditions near 0 mg/l.
- When conditions improved in the 1980s, fish returned to this area, but were contaminated with several chemicals including PCBs.
- Fish contaminant monitoring was initiated in tidal waters in the 1990s with PCBs and chlorinated pesticides the target contaminants.
- In 2000, monitoring was extended to non-tidal areas.
- In 2004, PFCs, PBDEs and dioxin/furans were added as target contaminants.

Sampling Design

- Fish samples were collected from 8 stations in both the tidal and non-tidal portion of the Delaware River.
- 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

Narrowsburg, NY	RM 290
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 are composites of standard fillets.
- Analytical Parameters & Methods:
  - 13 compounds using LC/MS/MS Method

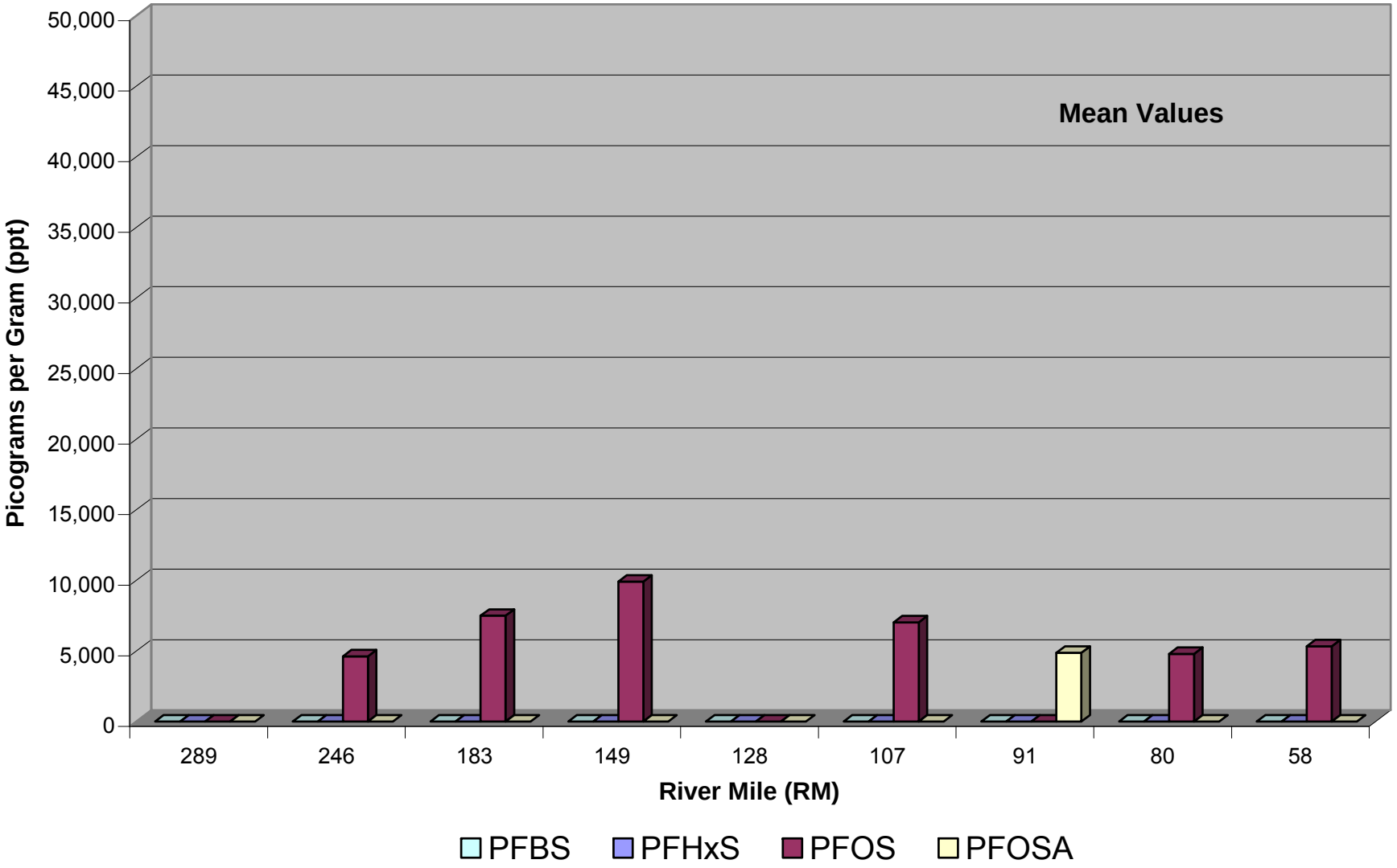
	Sulfonates
4	Perfluorobutanesulfonate (PFBS)
6	Perfluorohexanesulfonate (PFHxS)
8	Perfluorooctanesulfonate (PFOS)
8	Perfluorooctane sulfonamide (PFOSA

# of fluorinated carbons

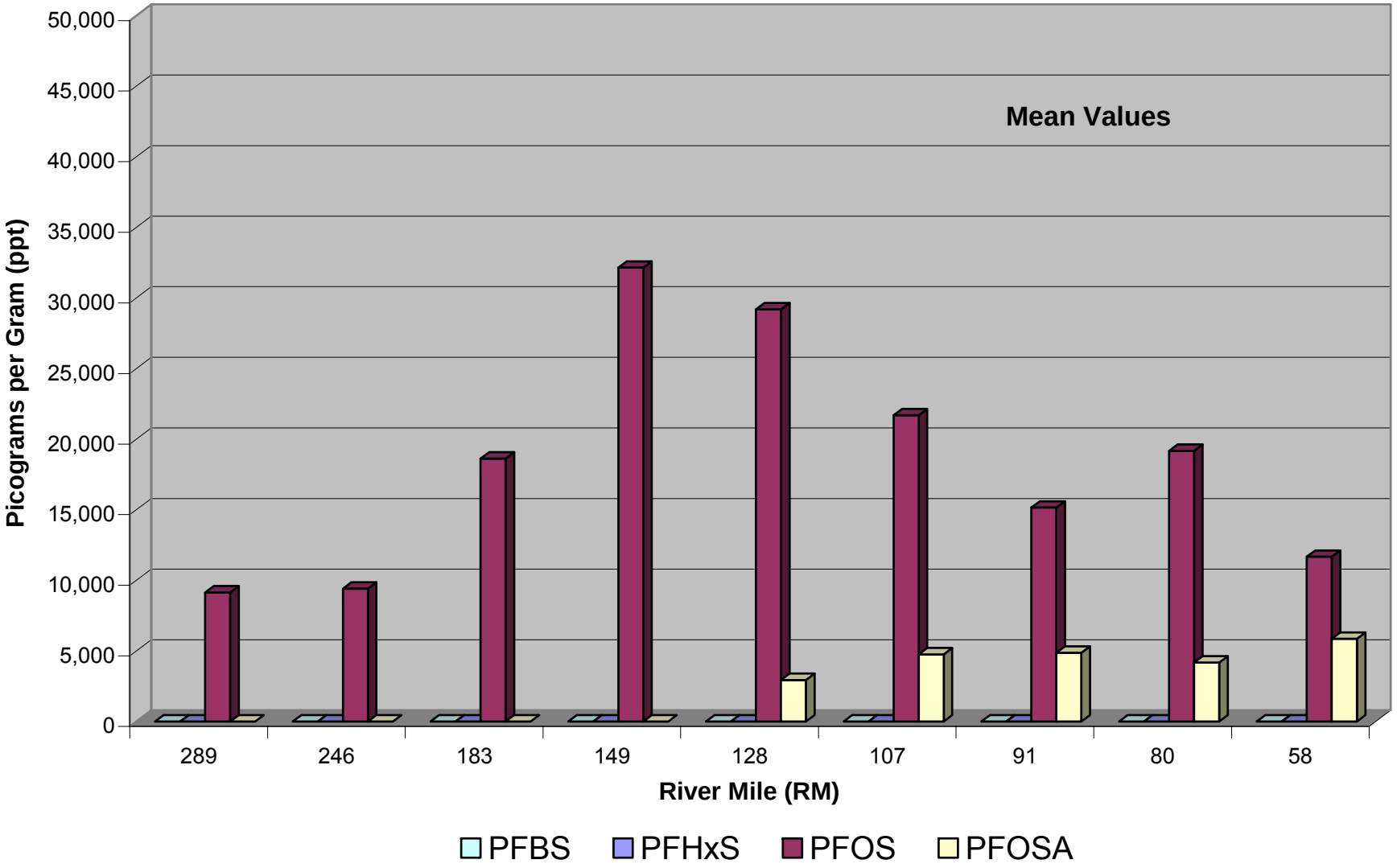
	Carboxylates
3	Perfluorobutanoate (PFBA)
4	Perfluoropentanoate (PFPeA)
5	Perfluorohexanoate (PFHxA)
6	Perfluoroheptanoate (PFHpA)
7	Perfluorooctanoate (PFOA)
8	Perfluorononanoate (PFNA)
9	Perfluorodecanoate (PFDA)
10	Perfluoroundecanoate (PFUnA)
11	Perfluorododecanoate (PFDoA)

- Analysis by Axys Analytical LTD

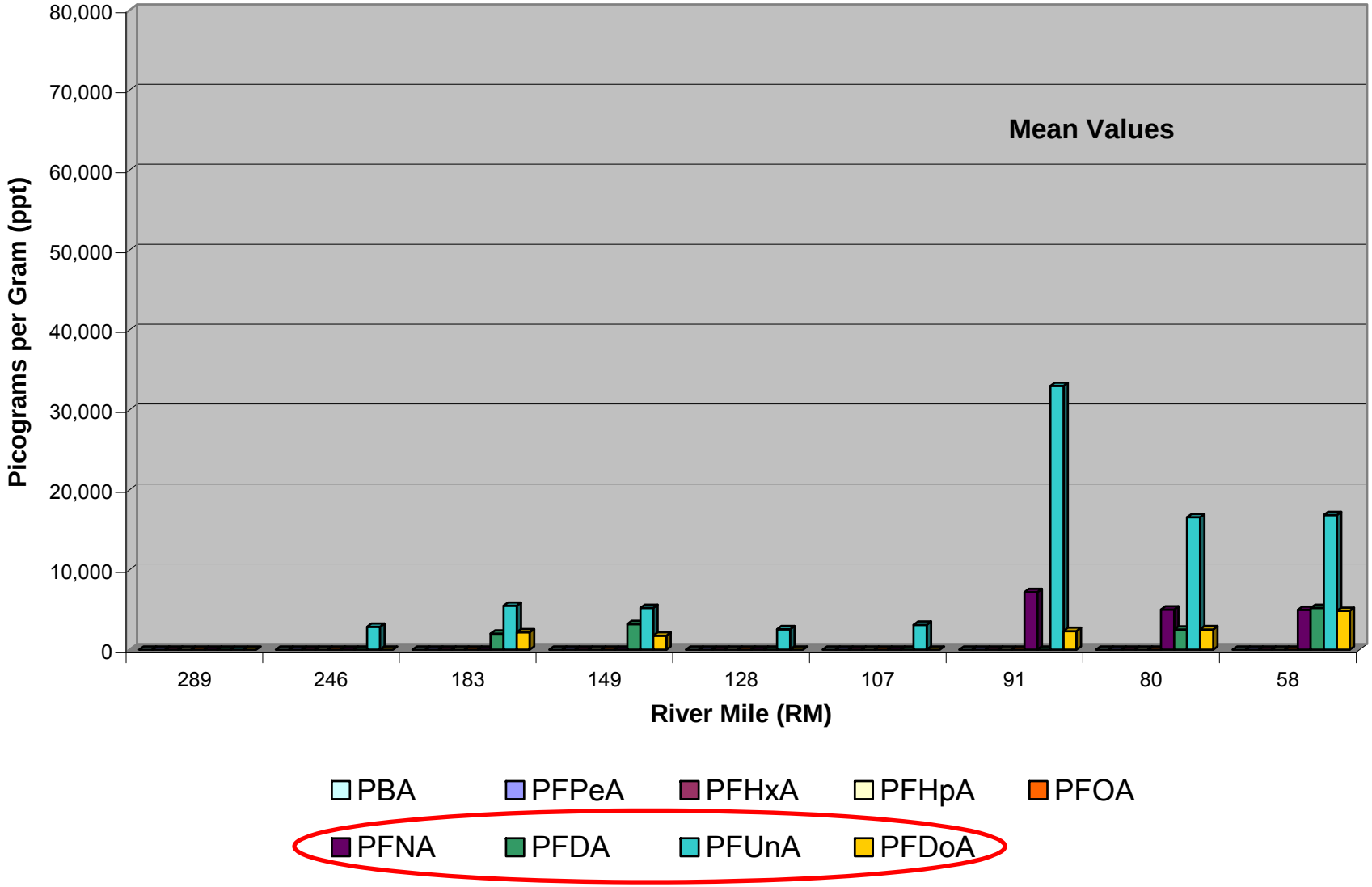
Perfluorinated Alkyl Sulfonate Results for Benthic Species
Delaware River - 2004 - 2007



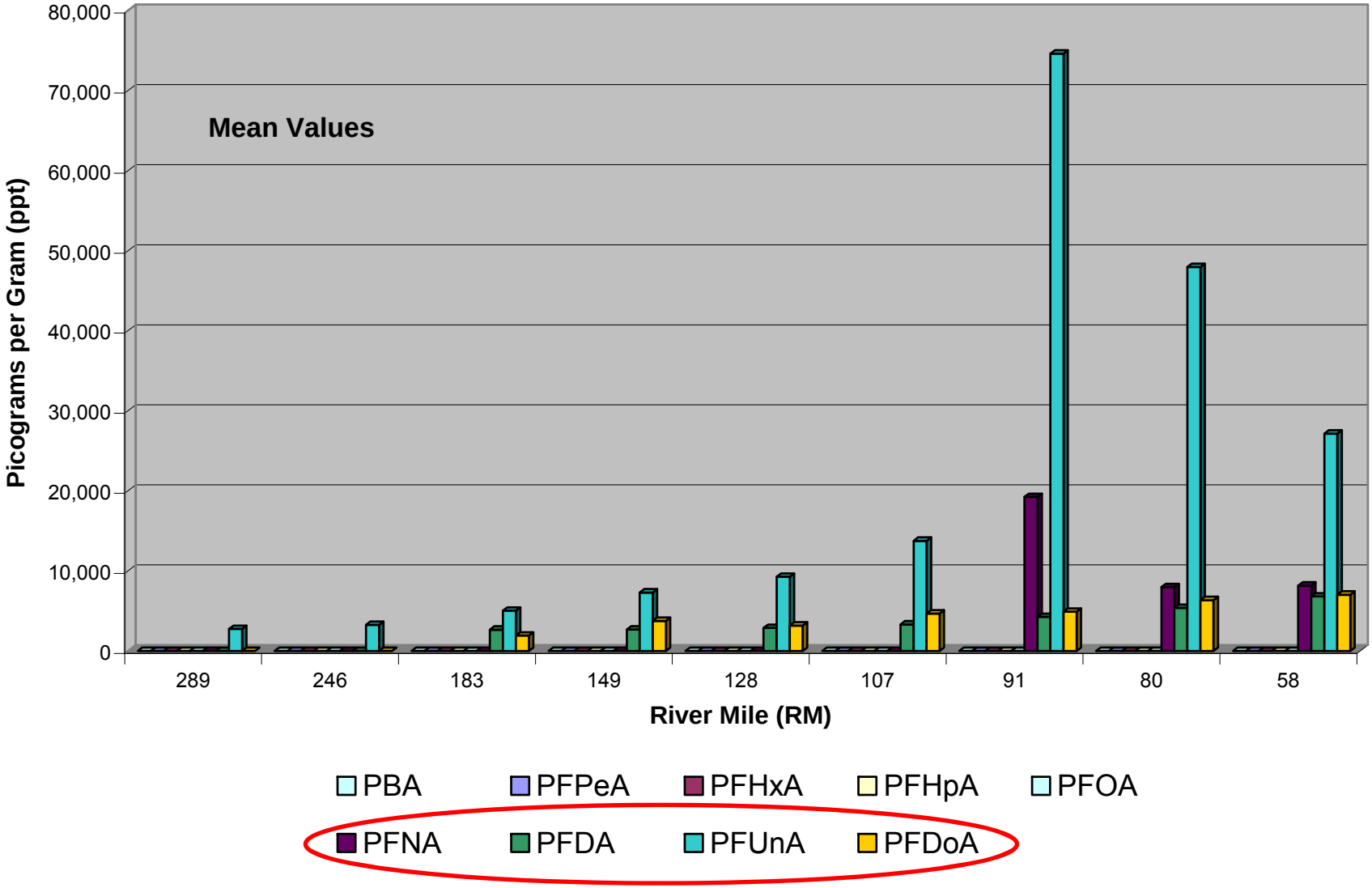
Perfluorinated Alkyl Sulfonate Results for Pelagic Species
Delaware River - 2004 - 2007



Perfluorinated Carboxylate Results for Benthic Species
Delaware River - 2004 - 2007



Perfluorinated Carboxylate Results for Pelagic Species
Delaware River - 2004 - 2007



Background Concentrations

- The northernmost sampling locations should reflect background concentrations since they are located within National Park Service units.

Type	Parameter	Mean (ppb)	Std Dev (ppb)
PFASs	PFOS	9.4	3.4
	PFOSA	U	-
PFCAs	PFNA	U	-
	PFDA	U	-
	PFUnA	3.1	0.7
	PFDoA	U	-

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PFCAs	PFNA	U	-
	PFDA	U	-
	PFUnA	*3.1*	0.7
	PFDoA	U	-

Summary

- DRBC conducted analysis of fish tissue samples from 9 locations for PFCs in the Delaware River Basin from 2004-2007.
- PFC concentrations were higher in pelagic compared to benthic species tested.
- Results indicated higher concentrations of PFOS/PFOSA (up to 35 ppb) in pelagic species near urban areas.
- Results indicated detectable concentrations of PFCAs with 8 fluorinated carbons or more (PFNA, PFDA, PFUnA and PFDoA).

Summary

- Highest tissue concentrations (~75 ppb) were observed for PFUnA in a pelagic species near the Philadelphia urban area.
- DRBC also conducted ambient water surveys in the tidal portion of the Delaware River from 2007 to 2009 to provide data for bioaccumulation and impairment assessments.
- Additional fish tissue sampling for PFCs is planned in 2010 as part of the DRBC's routine surveys.

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