Spatial and Temporal Trends in PCB Concentrations in Fish Tissue in the Mainstem of the Delaware River

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Presentation Themes

✔背景
  ▪ 程序目标
  ▪ PCB TMDLs 实施
  ▪ 预期目标

✔采样设计

✔结果

✔总结
Why monitor fish?

- Integrator of exposure.
- Endpoint for evaluating human health impacts from fish consumption.
- Interstate waters.
- Needed for Integrated Assessment of water segments by states and DRBC.
- Funding for programs is limited.
- Coordination w/ State partners.
PCB TMDLs Implementation

Goal is to achieve the recently adopted uniform water quality criterion of 16 picograms/Liter and eliminate the need for fish consumption advisories for Zones 2 through 6.

For PCBs, however, contaminated sediments will continue to bleed PCBs to the water column even if all active sources of PCBs are eliminated, resulting in a significant lag time to reach the water quality criterion.
Projected, averaged Total PCB concentrations for Zones 2 & 3
Boundaries @16pg/L; current sediment condition; 99.97% all load reduction

Stage 2 Model

Years

Total PCB concentration (pg/L)

Zone 2

Zone 3

Proposed Criteria (16 pg/L)
PCB TMDLs Implementation

- TMDLs for certain hydrophobic pollutants like PCBs will require long-term strategies to achieve their goals.
- **Expectation:**
  Ambient water and fish tissue concentrations will not decrease until sources of PCBs are reduced and sediment concentrations decline as uncontaminated sediment is deposited in the estuary.
Sampling Design

- Design considerations:
  - Locations – tidal vs. non-tidal?
  - Species – resident or migratory?
  - Analytical parameters?
Sampling Design

- Fish samples are collected from 8 sites in both the tidal (5 sites) and non-tidal (3 sites) portions 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.

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
Samples are composites of standard fillets, and consist of a composite of 4 to 5 fish of similar size and weight.

Analytical Parameters & Methods:
- Starting in 2004, all analyses were conducted by Axys Analytical LTD using Method 1668A.
- Target analytes: all 209 PCB compounds (i.e., PCB congeners)
PCBs in Fish Tissue
Delaware River Estuary
2000 to 2012

TMDLs established
PCBs in Fish Tissue
Non-Tidal Delaware River
1991 to 2012

Nanograms per gram (ppb) - wet weight

Years

2003

2004

2005

2006

2007

2010

2012

0.0

100.0

200.0

300.0

400.0

500.0

600.0

700.0

800.0

900.0

1000.0

Smallmouth Bass

White Sucker
Historical Trend in Total PCBs in Fish Tissue
Tacony-Palmyra Bridge - Delaware Estuary

Nanograms per gram (ppb) - wet weight

Years


Channel Catfish  White Perch

Legend
Historical Trend in Total PCBs in Fish Tissue
Raccoon Creek - Delaware Estuary

Nanograms per gram (ppb) - wet weight

Years


Channel Catfish  White Perch
Summary

❖ Since the development of the PCB TMDLs in 2003, the DRBC has analyzed fish tissue samples from 9 locations in the non-tidal and tidal portions of the Delaware River.

❖ Highest concentrations are observed in the urban areas of the estuary.

❖ Concentrations in samples collected in the non-tidal portion of the river had significantly lower concentrations of PCBs.

❖ PCB concentrations were higher in benthic species compared to pelagic species tested at all locations.
Summary

- As expected, tissue concentrations are not declining despite a 46% reduction in the loadings of PCBs from point sources from 2005 to 2011.
- Declines in fish tissue concentrations can be expected sooner in areas where there is less sediment contamination such as Zone 2 and Delaware Bay.
- Continued implementation of the long-term strategy developed by the co-regulators is needed to achieve the goal of eliminating the need for fish consumption advisories.
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Information on the TMDLs, model development, sampling and analytical information, and other implementation requirements and resources are available on the DRBC website at:

http://www.state.nj.us/drbc/quality/toxics/pcbs/