Contaminants of Emerging Concern in the Tidal Delaware River

A Pilot Monitoring Survey

Delaware Estuary Science and Environmental Summit
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- Goal: collect ambient water data on contaminants of emerging concern
- Participants: DRBC, Axys Analytical Laboratories, American Aquatic Testing Laboratory

Delaware River Basin Commission

DELAWARE · NEW JERSEY
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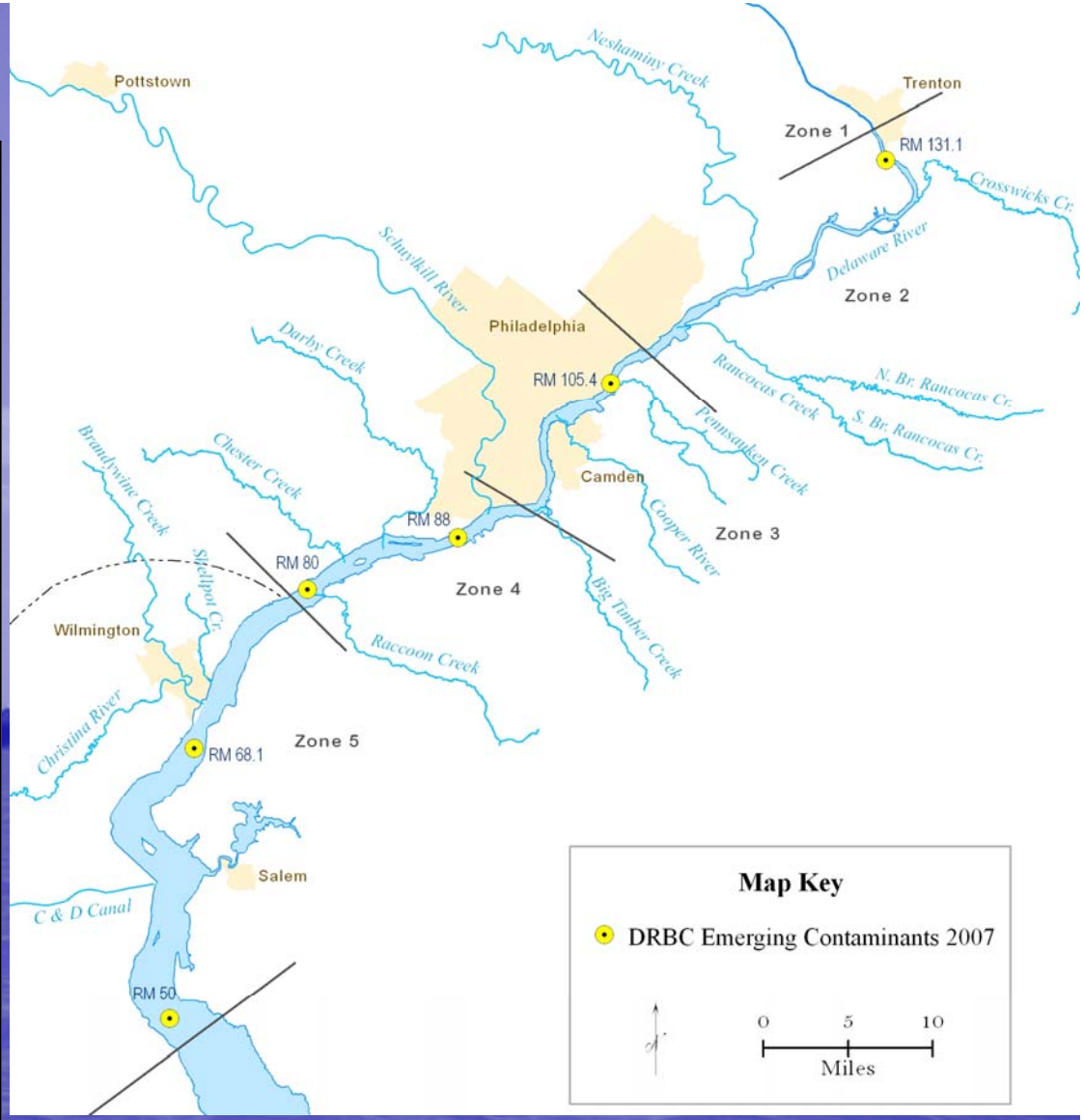
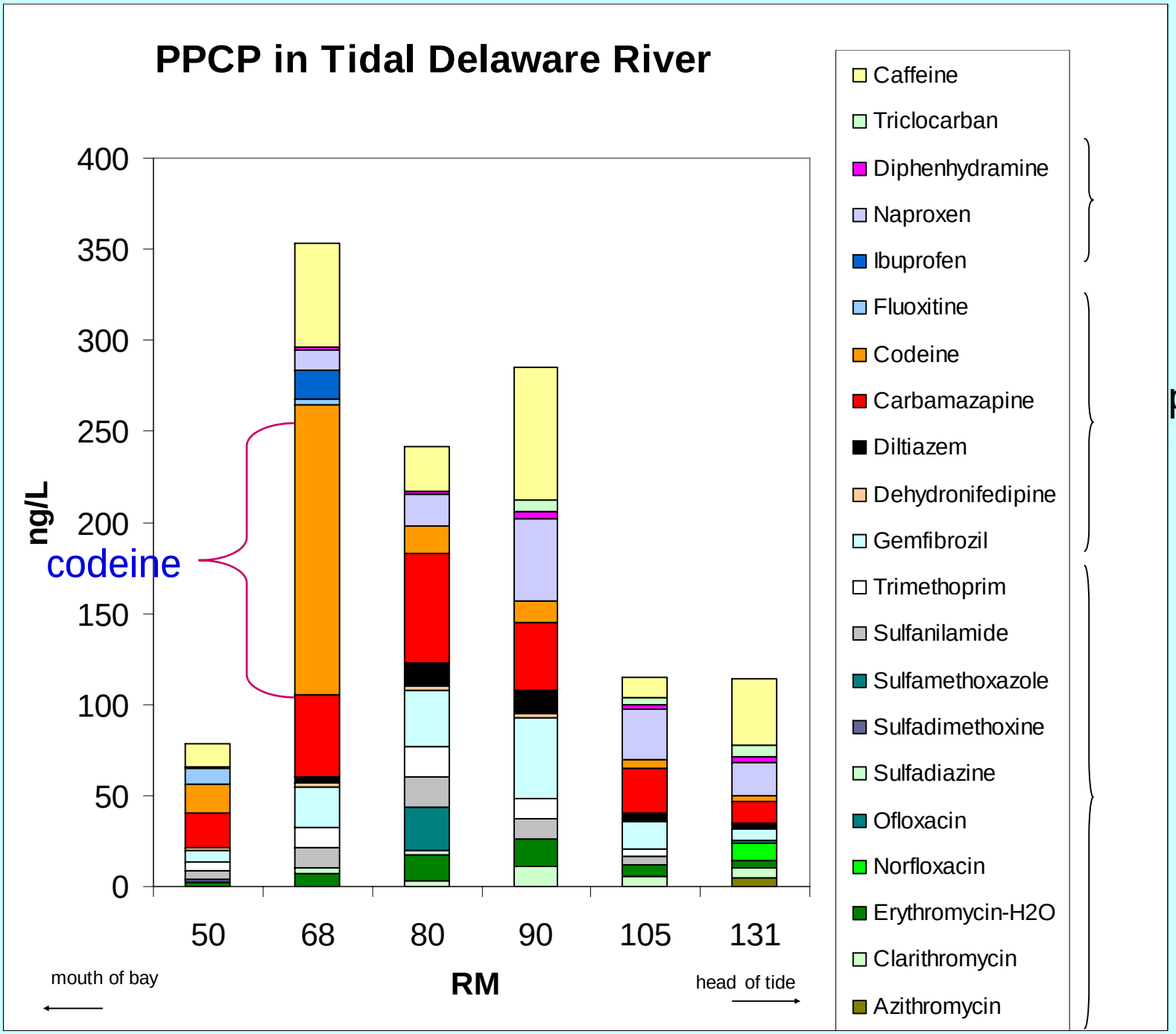
UNITED STATES OF AMERICA

Delaware River Basin



Sampling Locations

2007 Parameters	# of analytes
PBDE - polybrominated diphenyl ethers	46 HR GC/MS EPA Method 1614
PFC - perfluorinated compounds	13 LC/MSMS
PPCP - pharmaceuticals and personal care products	54 LC/MSMS
Hormones and sterols	24 GC/LRMS
Carbamate pesticides	21 LC/MSMS
NP and NPE – nonylphenol and NP ethoxylates	3 GC/MS


PPCP in Tidal Delaware River
ng/L
400
350
300
250
200
150
100
50
0
codeine
50
68
80
90
105
131
RM
mouth of bay
head of tide
Caffeine
Triclocarban
Diphenhydramine
Naproxen
Ibuprofen
Fluoxitine
Codeine
Carbamazapine
Diltiazem
Dehydronifedipine
Gemfibrozil
Trimethoprim
Sulfanilamide
Sulfamethoxazole
Sulfadimethoxine
Sulfadiazine
Ofloxacin
Norfloxacin
Erythromycin-H2O
Clarithromycin
Azithromycin
OTC
prescription
antibiotics

- Aquatic ecotoxicity data, primarily based on individual compounds and single species tests, are readily available for only 16 out of the 21 PPCP analytes detected limiting assessment of risk to aquatic life.

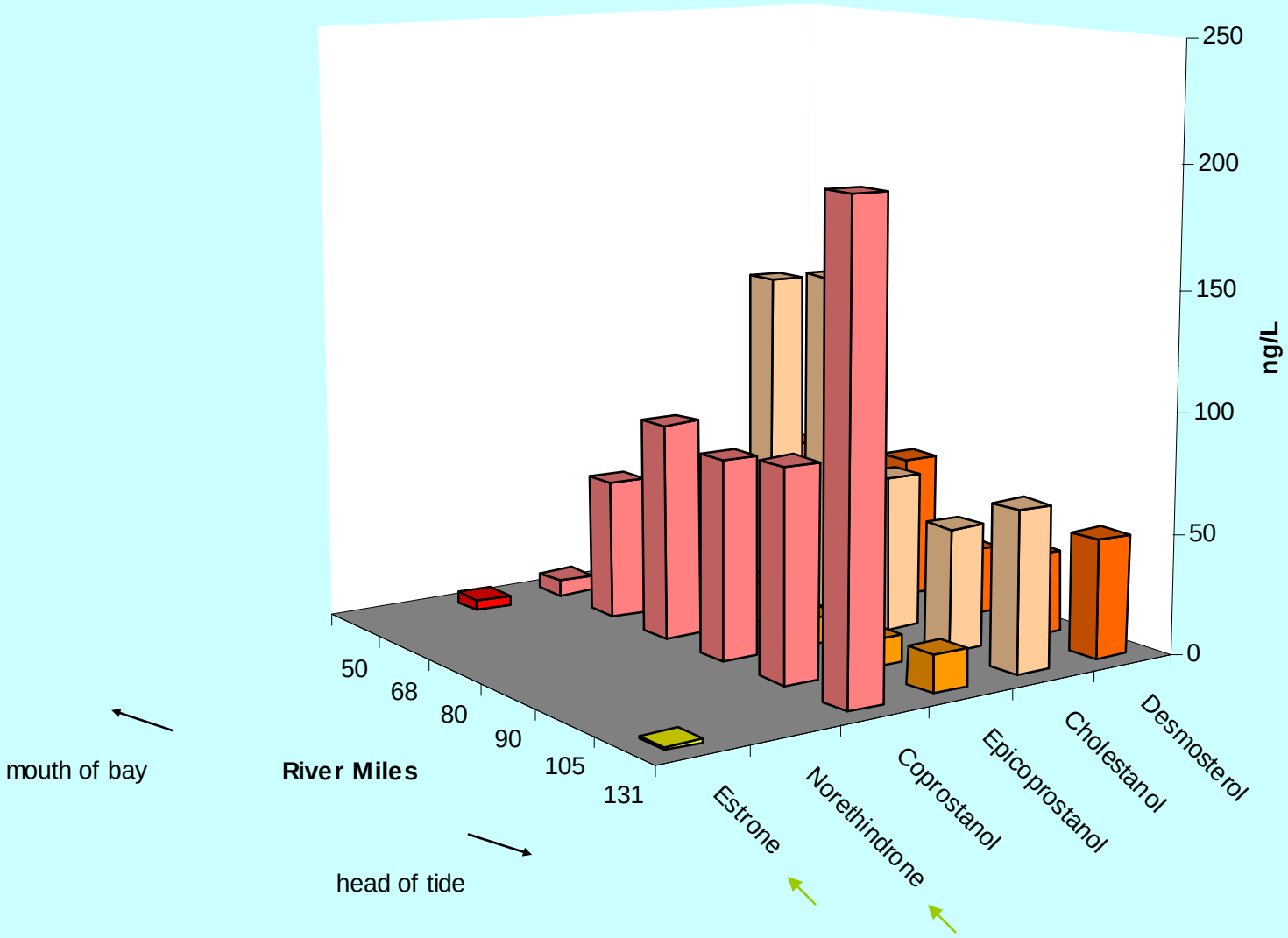
- Risk Index = PEC/PNEC
  - Risk Index > 1.0 (clarithromycin effect on algal growth)
  - Risk Index > 0.1 (carbamazapine effect on *Ceriodaphnia dubia*, ibuprofen effect on *Hydra*, erythromycin and fluoxitine effect on *Pseudokirchneriella subcapitata*, sulfamethoxazole effect on cyanobacteria)
  - First Tier screening for prioritization of future assessment and characterization

- Concurrent, short-term chronic toxicity tests in the ambient water samples with endpoints of survival, growth and reproduction did not indicate toxicity.

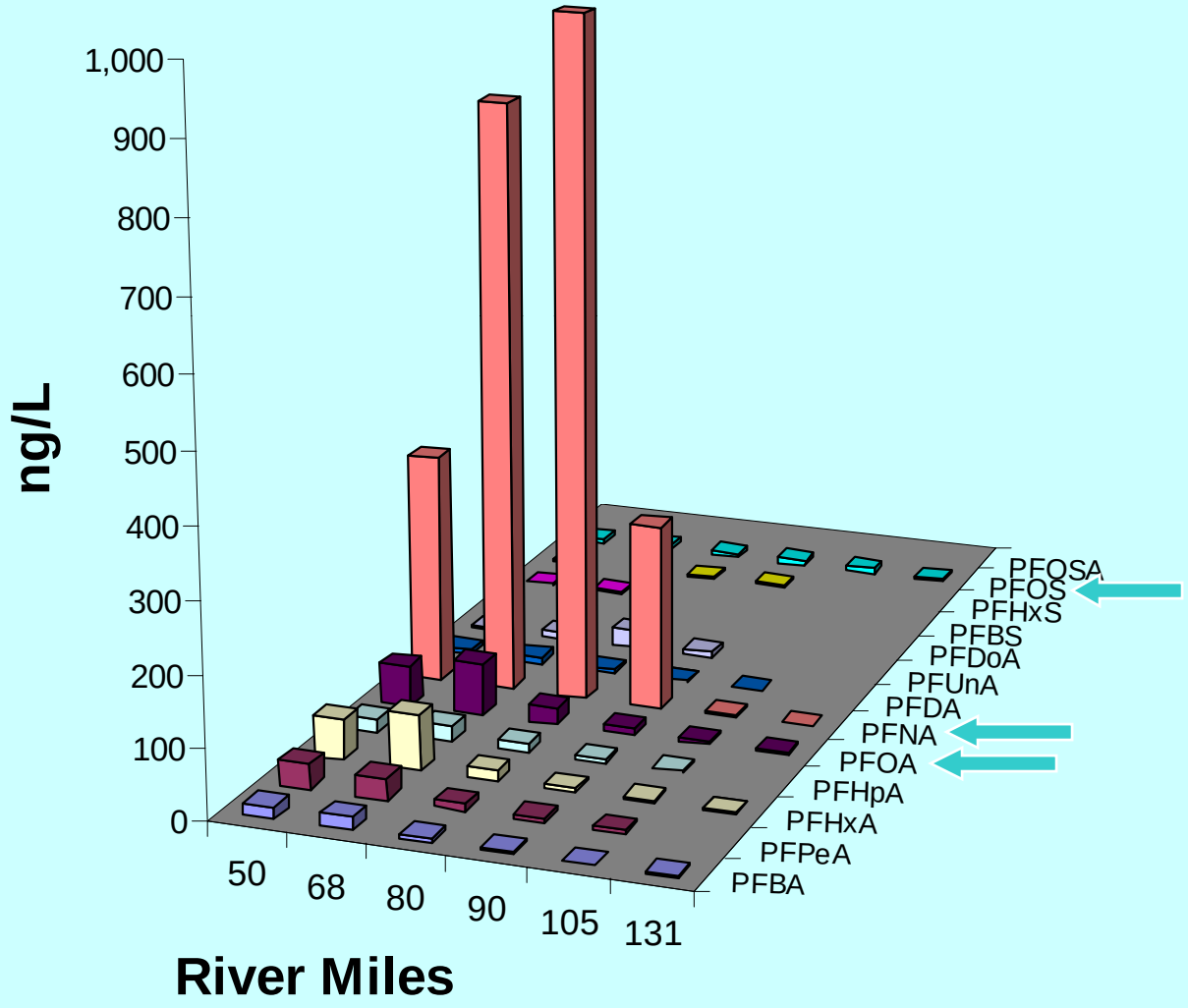
- In salinities from 0 to 10 ppt using six species:
  - fathead minnow, *Pimephales promelas* in a 7-day test
  - mysid, *Americamysis bahia* in a 7-day test
  - inland silverside, *Menidia beryllina* in a 7-day test
  - water flea, *Ceriodaphnia dubia* maximum of 8-days duration
  - green alga, *Pseudokirchneriella subcapitata* in a 96-hour test
  - amphipod, *Hyalella azteca* in a 10-day water-only test

- Assessment of ecotoxicity from PPCP in the tidal Delaware River would be further informed by estrogenicity screening, biomarker measurements and population (sex ratio) surveys.

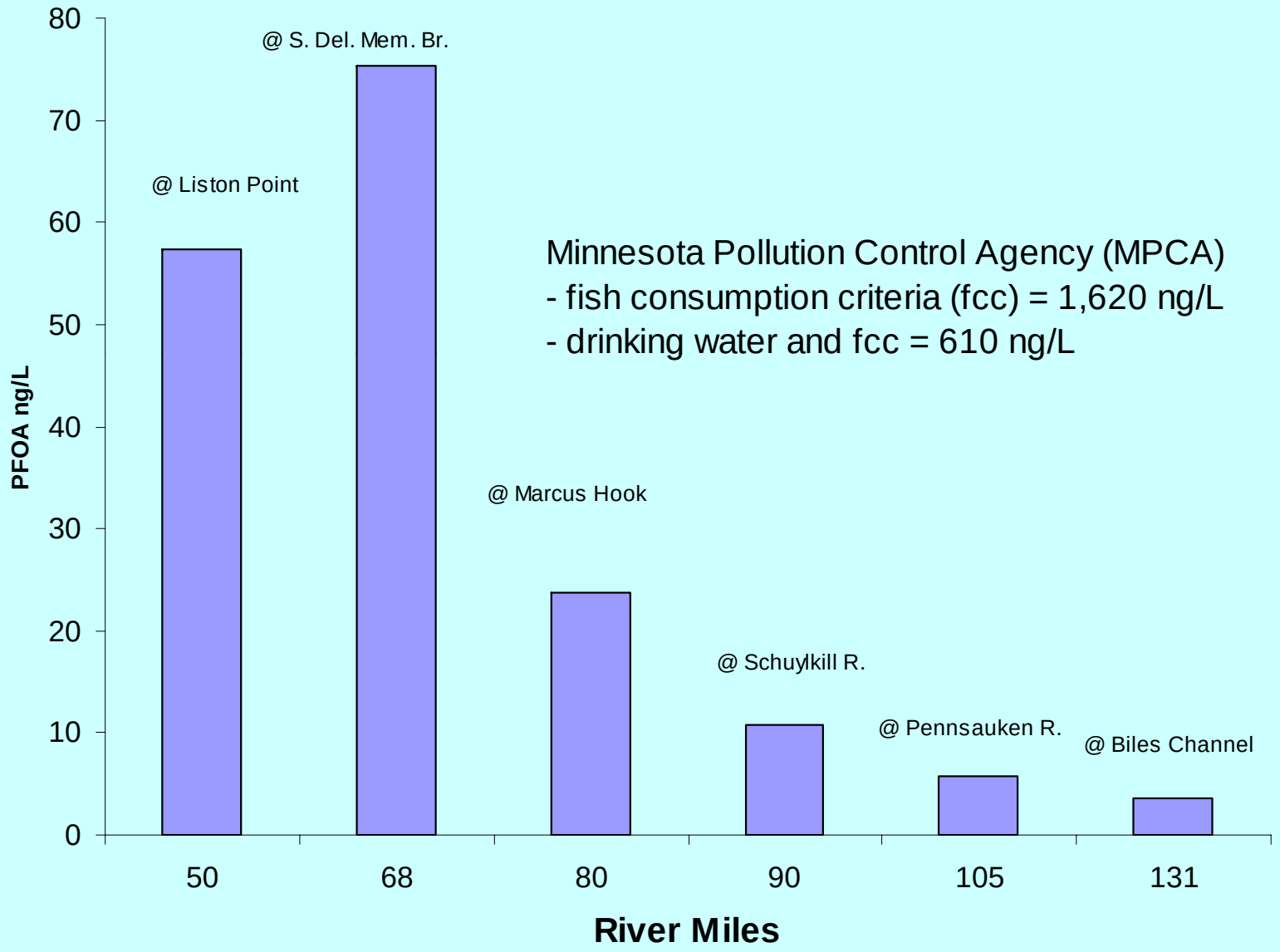
Hormones and Sterols In Ambient Waters Of The Tidal Delaware River



PFC In Ambient Waters Of TheTidal Delaware River

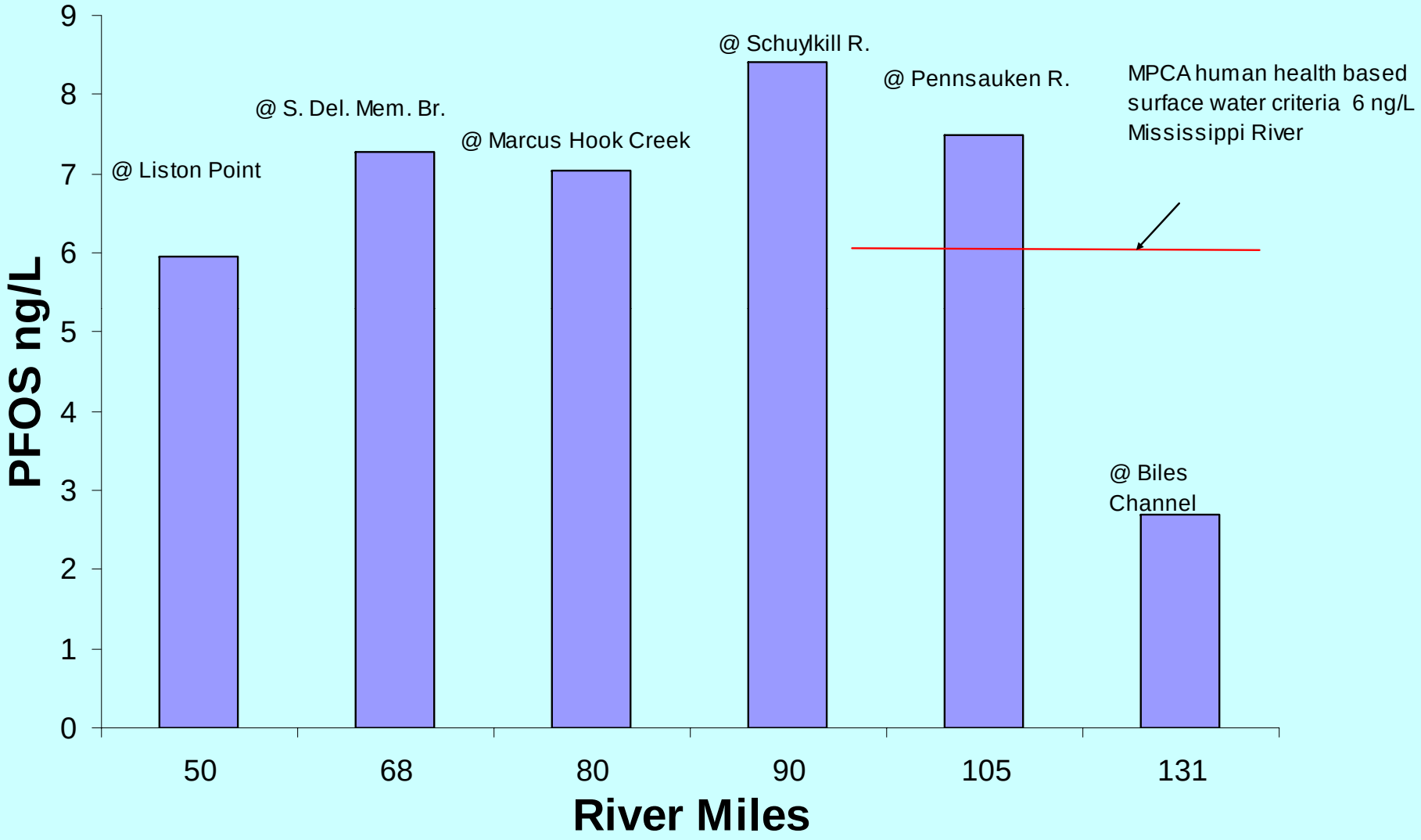


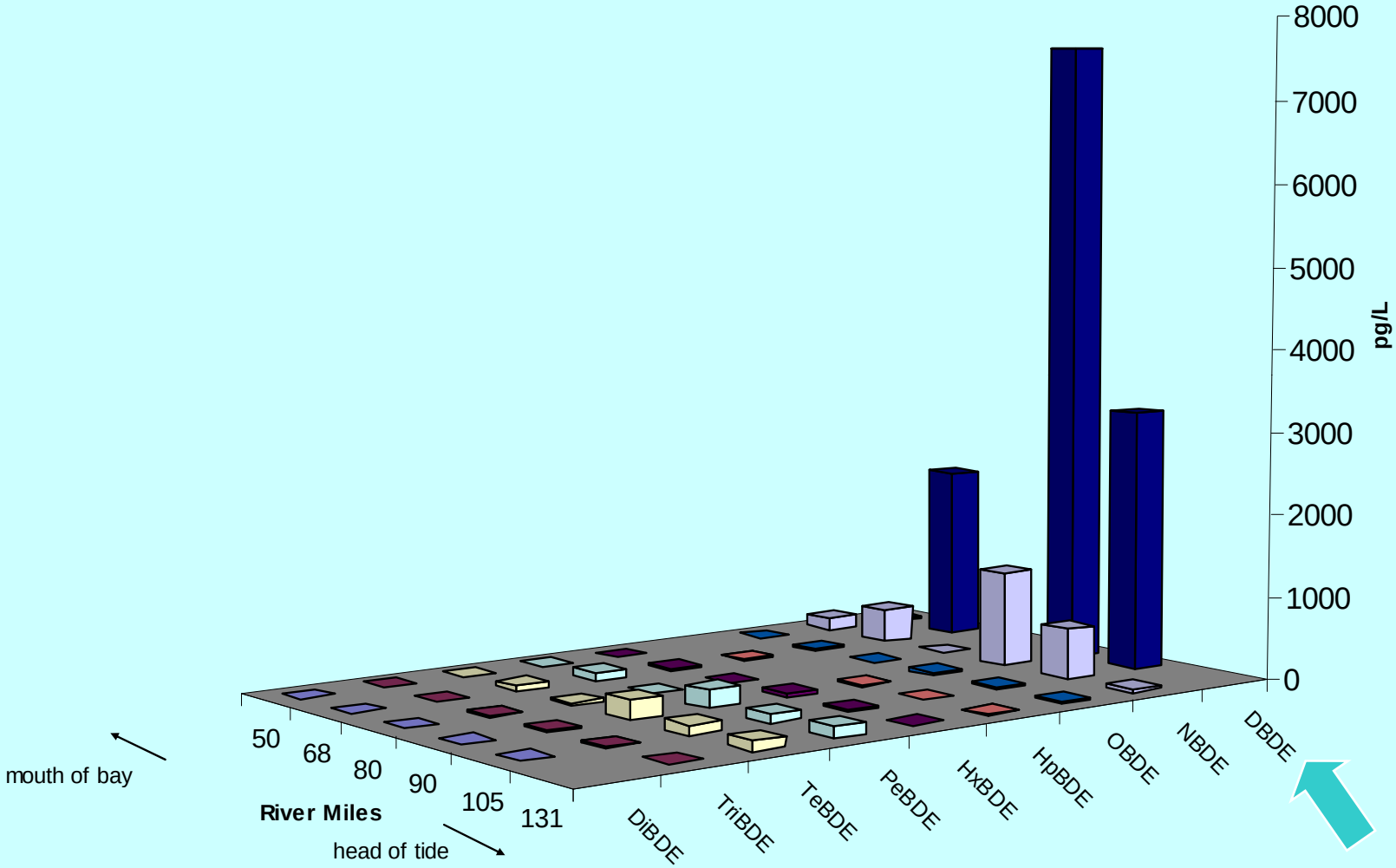
PFOA In Ambient Water Of TheTidal Delaware River



Minnesota Pollution Control Agency (MPCA)
- fish consumption criteria (fcc) = 1,620 ng/L
- drinking water and fcc = 610 ng/L

PFOS In Ambient Waters Of TheTidal Delaware River




PBDE In Ambient Waters Of TheTidal Delaware River
8000
7000
6000
5000
4000
3000
2000
1000
0
pg/L
50
68
80
90
105
131
River Miles
mouth of bay
head of tide
DiBDE
TriBDE
TeBDE
PeBDE
HxBDE
HpBDE
OBDE
NBDE
DBDE

Summary

PPCP
- Detected 21 compounds out of 54 compounds
- Concentrations in the ng/L range
- Availability of ecotoxicity data limiting assessment of risk to aquatic life

Hormones
- Primarily detected fecal sterols
- New analytical method with few surrogates available and numerous QA/QC notes

PBDE
- DBDE and other homologs detected at pg/L levels
- PBDE monitoring continuing in fish tissue

PFC
- PFNA highest PFC concentrations at ng/L levels
- PFOS levels exceed some safety benchmarks
- Additional information needed for assessment especially on longer chain and sulfonated compounds

Next Steps

- Survey: 2008 sampled; 2009 planned
- Information exchange
- Investigate additional assessment methodologies
  - e.g., Species sensitive distribution
- Characterize effects
  - e.g., estrogenicity bioassays, aquatic life

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http://www.state.nj.us/drbc/emc.htm