Adapting an Ambient Monitoring Program to the Challenge of Managing Emerging Pollutants in the San Francisco Estuary

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Overview

- The Management Challenge
- Beginning to Meet the Challenge through Monitoring and Assessment
- Result Highlights - for details go to: www.sfei.org)
- Future Steps

"Identifying pollutants using our standard approach is like using Peterson's Guide to North American Birds in the Costa Rican rainforest"

Robert Risebrough

Thanks to:

- Regional Monitoring Program Participants
- RMP Re-design and Exposure and Effects Workgroups

Management Challenge

- Potential environmental risks of most pollutant groups have yet to be examined
- Current regulatory approaches don't take interactive, additive, and indirect pollutant/metabolite effects into consideration
- Complex mixtures in environmental samples

A Few Statistics

- As of 2005, nearly 9 million organic and inorganic substances are commercially available
- 240,000 of those are inventoried
- A miniscule percentage is regulated in the US.

What is currently managed?

- 126 “Priority Pollutants” for which standards exist
- A select few additional pollutants in non-systematic fashion
- The focus is on a pollutant-by-pollutant approach (e.g., TMDLs)

Adaptations to the Regional Monitoring Program

- Retrospective, “forensic” analysis of chromatograms
- Expansion of special studies
- Targeted measurements of selected additional compounds
- New method development

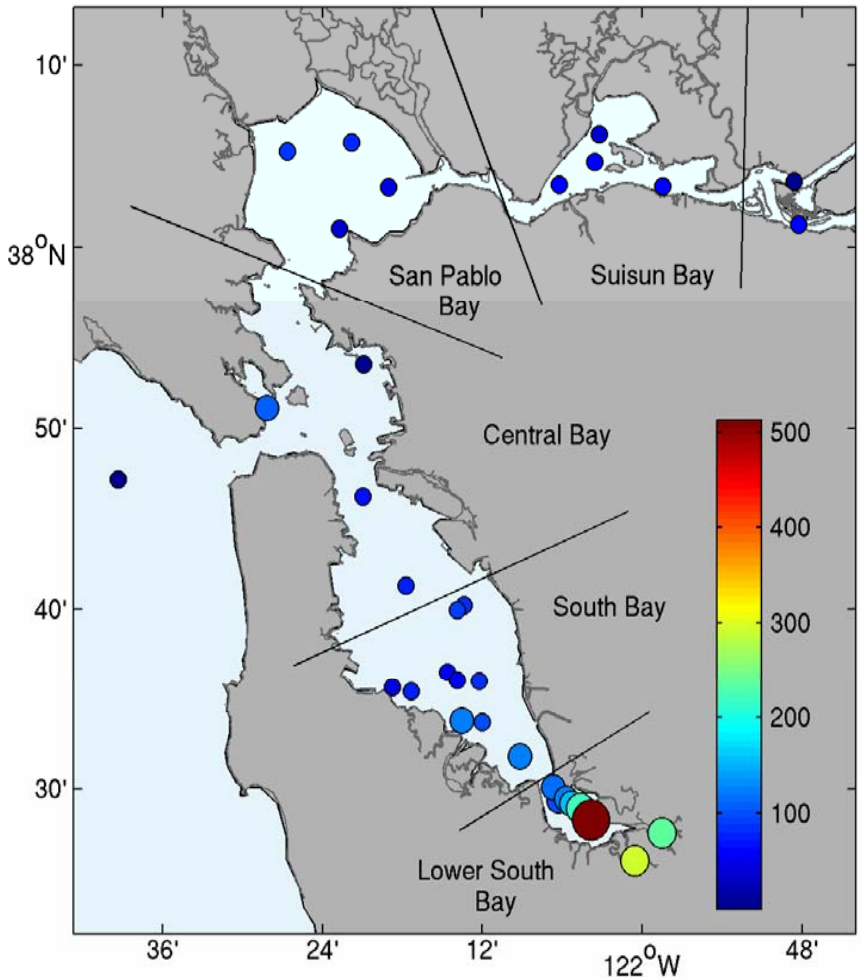
Retrospective Analysis Highlights

- most unknown peaks were identified (>90%)
- levels ranged from pg/L (ppq) to mg/L (ppb)
- contaminants did not exceed lowest LC50 toxicity thresholds for most sensitive aquatic species

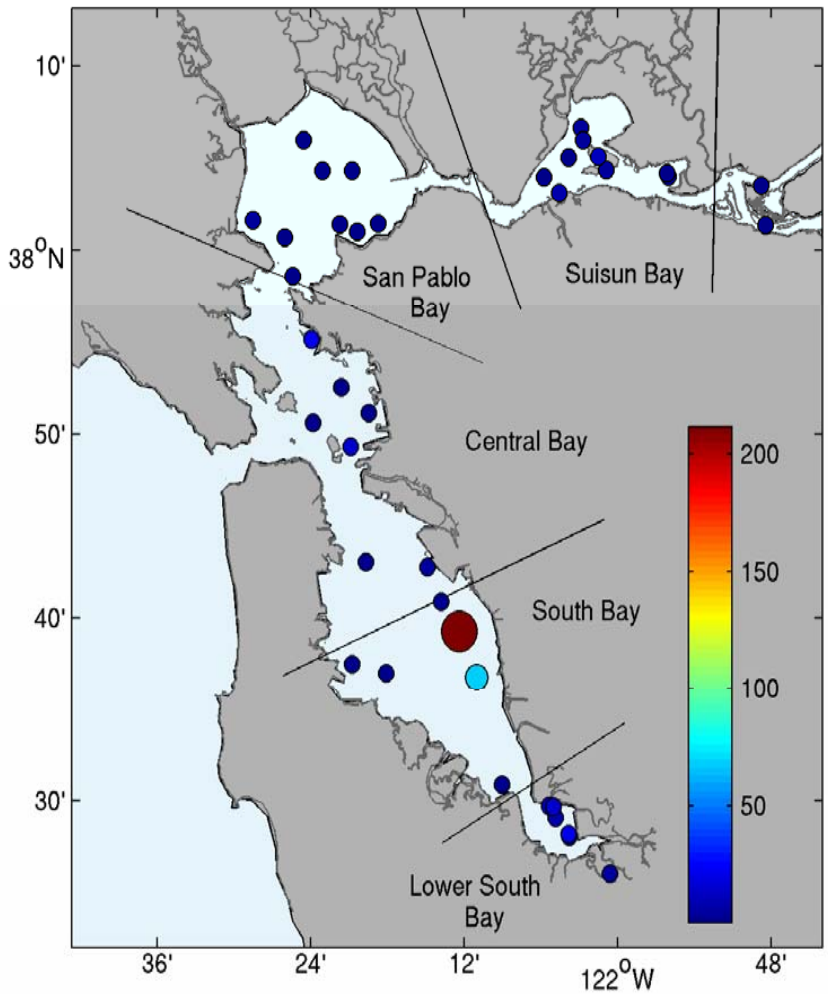
Retrospective Analysis of Water and Sediment Samples Resulted in New Target Compounds:

- PBDEs
- Phthalates
- P-Nonylphenol
- Triphenylphosphate
- Nitro and Polycyclic Musks

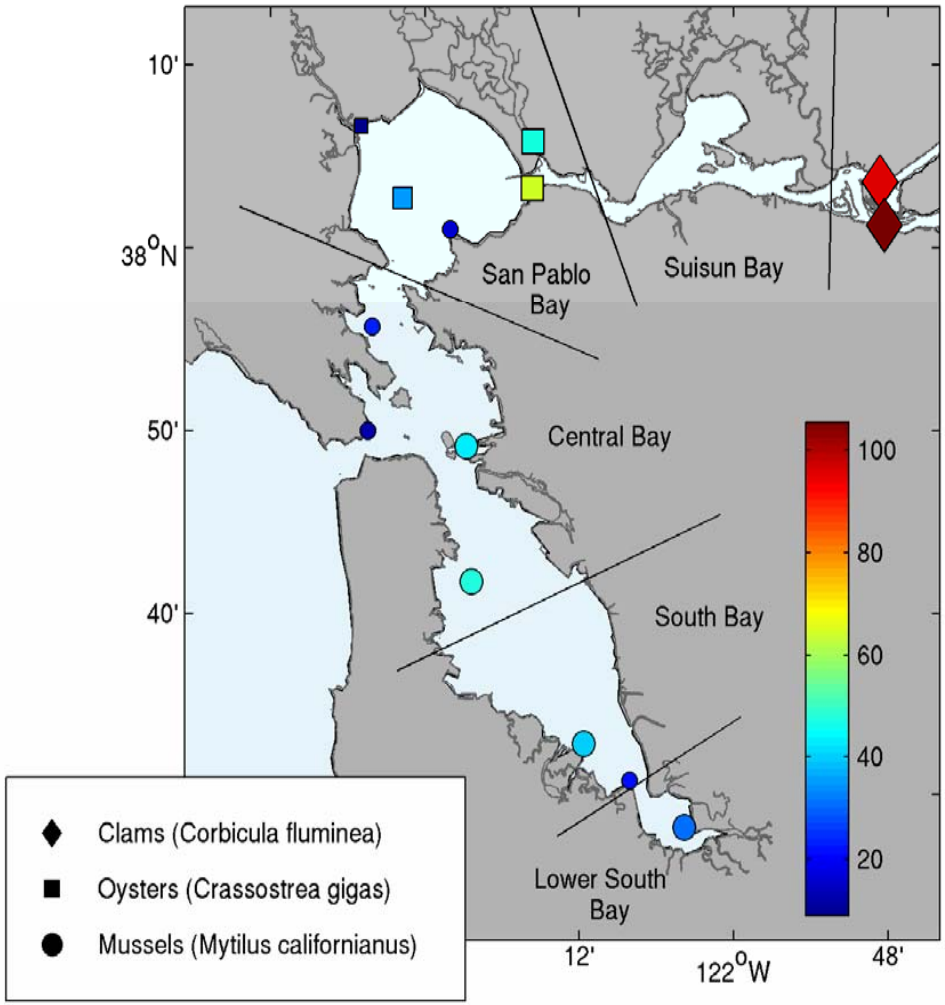
PBDEs Water


10'
38°N
50'
40'
30'
San Pablo Bay
Suisun Bay
Central Bay
South Bay
Lower South Bay
500
400
300
200
100
36'
24'
12'
122°W
48'

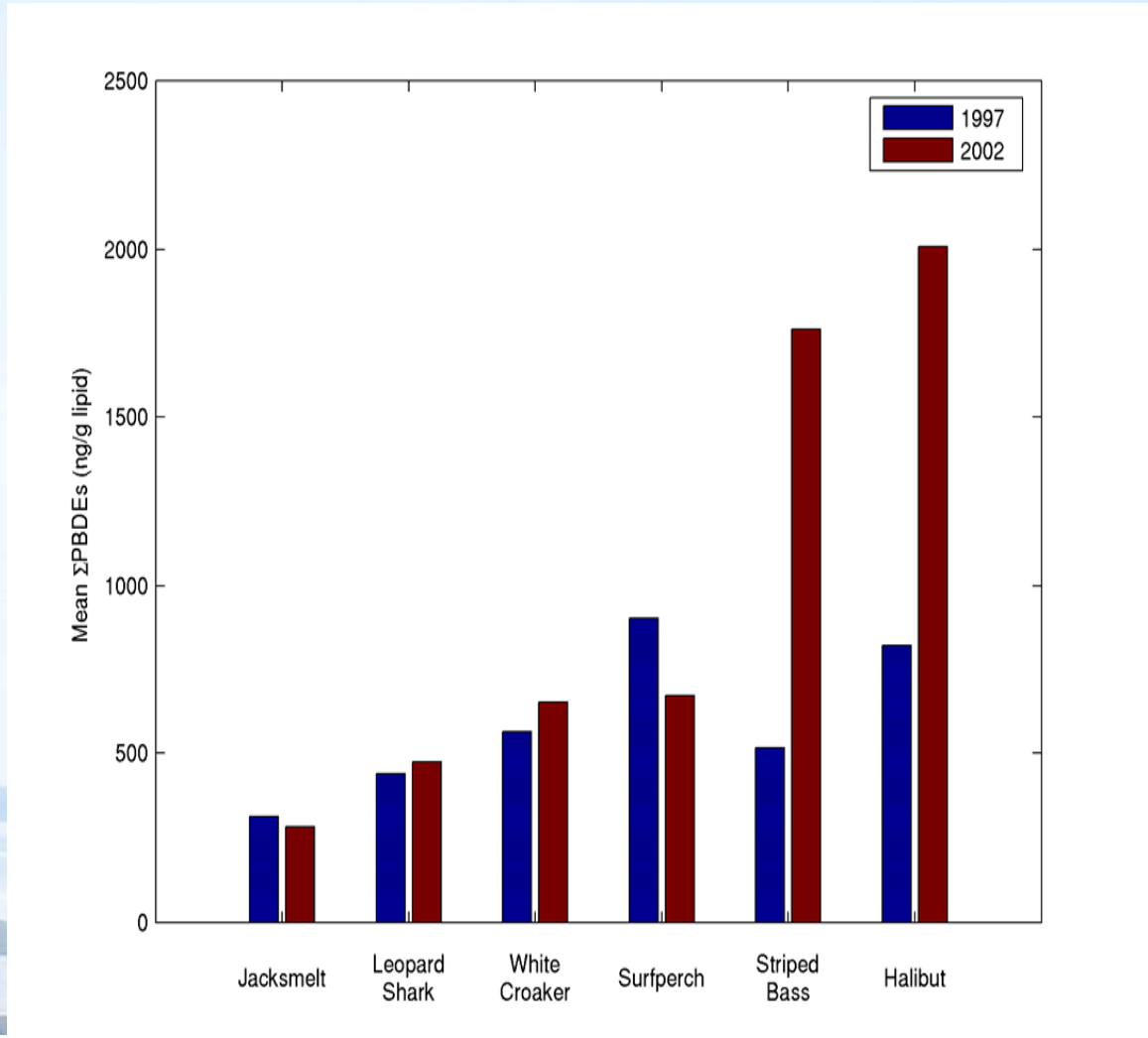
PBDEs Sediment



PBDEs Bivalve Tissue

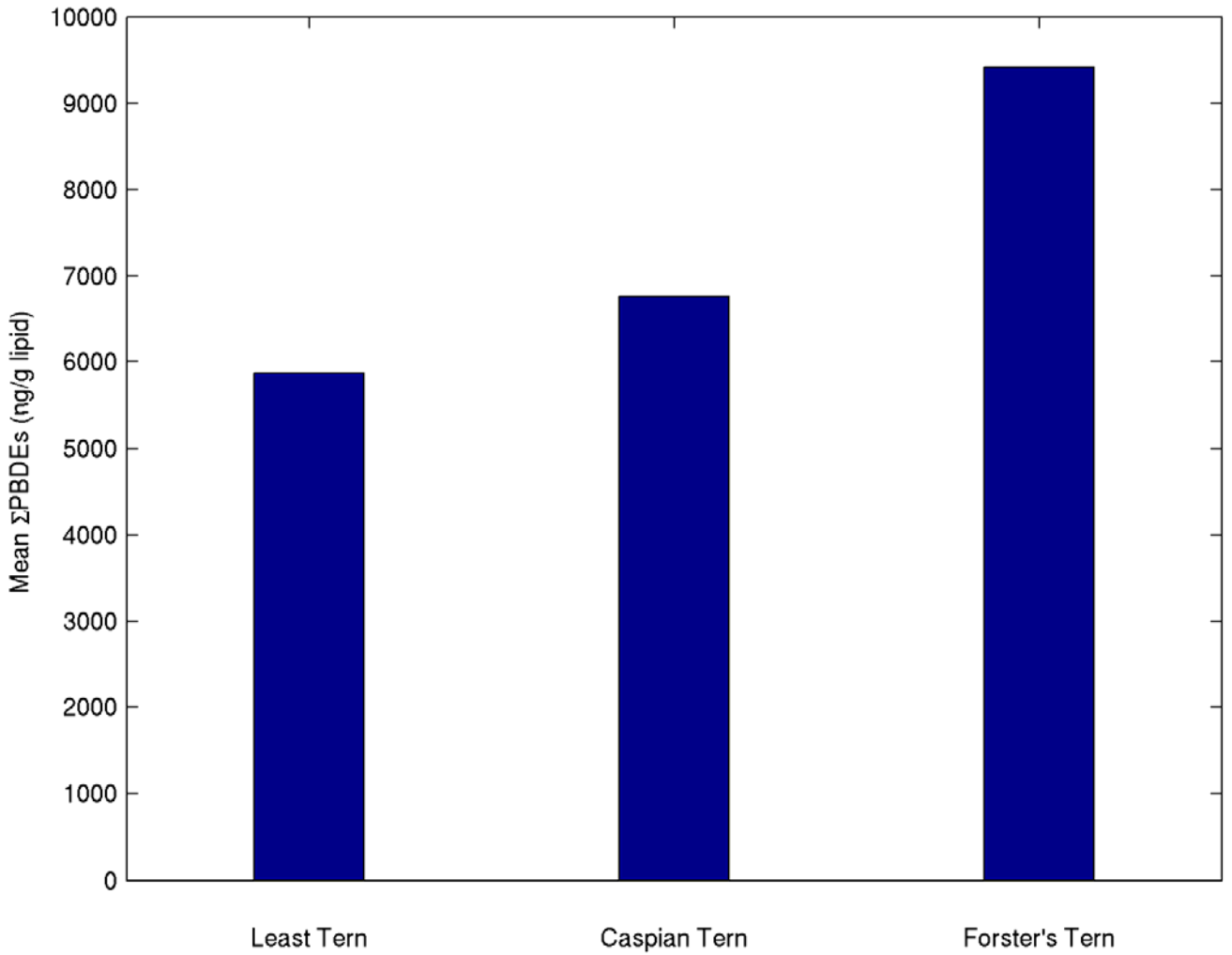


PBDEs in Fish 1997-2002



PBDEs – Least Tern Eggs

(She et al., 2004)



New Targeted Compounds

Chemical	Major Health Concerns	Future Steps
PBDEs (water, sediment, tissue)	Endocrine system disruption (targets thyroid), bioaccumulation, carcinogenic, persistent in the environment	Continue monitoring in water, sediment, tissues (bivalves, fish) and bird eggs

New Targeted Compounds, cont.

Chemical	Major Health Concerns	Future Steps
p-Nonylphenol water sediment tissue	Endocrine System Disruption	Discontinue in water and sediment; Concentrations in Estuary below concern. Consider fish tissue analysis in 2006.

Targeted New Compounds, cont.

Chemical	Major Health Concerns	Future Steps
Nitro and Polycyclic Musks (tissue only)	Bioaccumulation, toxicity in aquatic biota (efflux pump inhibitors), estrogenic in fish	Review data and evaluate Polycyclic musks.

Targeted New Compounds, cont.

Chemical	Major Health Concerns	Future Steps
Triphenylphos-phate (tissue only)	Bioaccumulation, human toxicity, unknown toxicity to aquatic biota	Discontinue monitoring
Phthalates water sediment tissue	Endocrine system disruption, bio-accumulation, toxicity	Discontinue monitoring – blank contamination is problematic. Monitored in cormorant eggs in 2004; evaluate

Targeted New Compounds, cont.

Chemical	Major Health Concerns	Future Steps
Perfluorinated Compounds (PFOS)	Bioaccumulation	Consider monitoring in water, sediments, tissues and bird eggs
Pharmaceuticals	Toxicity Unknown effects	Consider monitoring in water only due to their high solubility

Conclusions

- The current approach of targeted chemical-by-chemical monitoring cannot anticipate future concerns
- Develop more integrative measures and bioassays responsive to multiple stressors
- Conduct periodic assessments of compositional change ("fingerprinting")