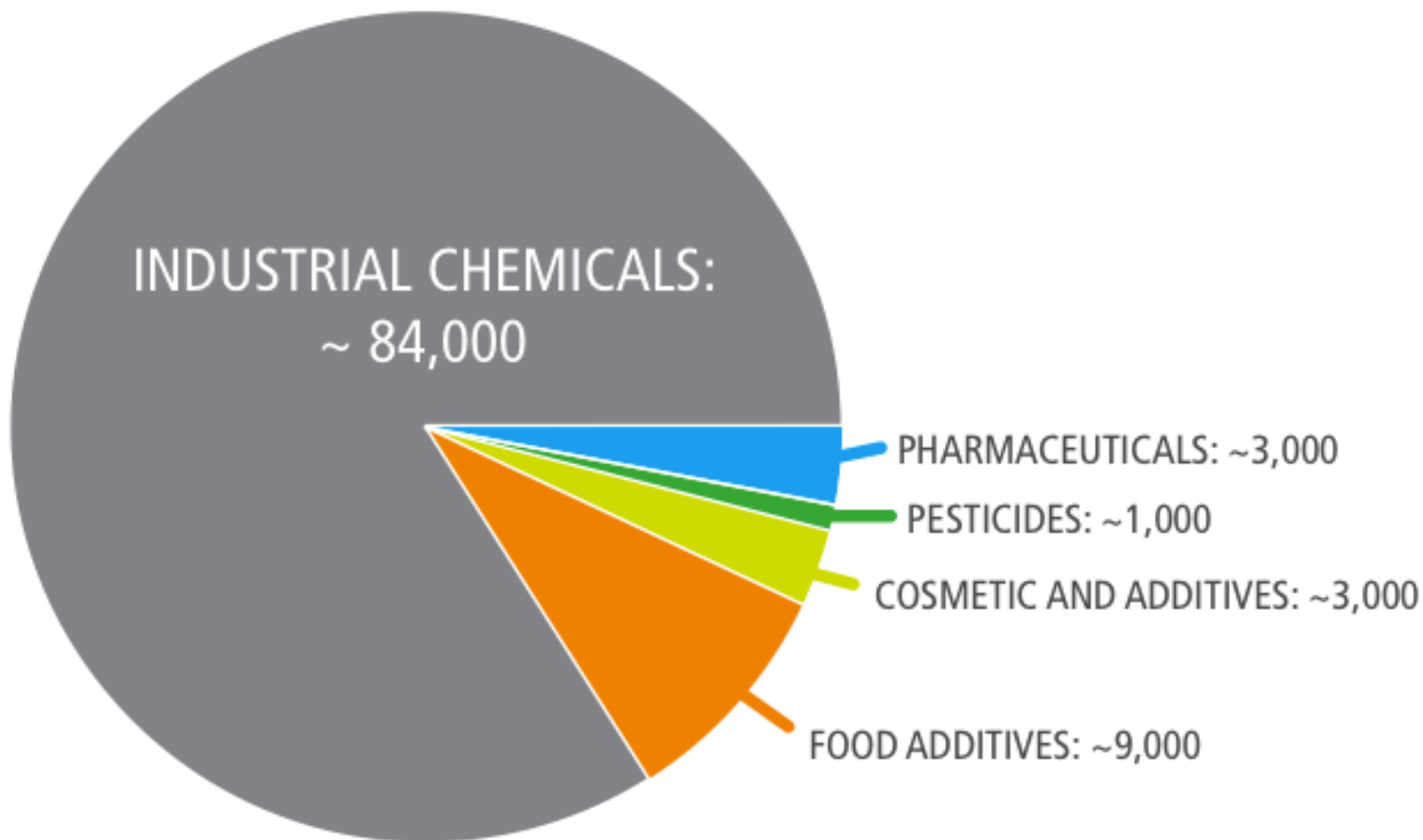


Contaminants of Emerging Concern: Synthesis and Strategy

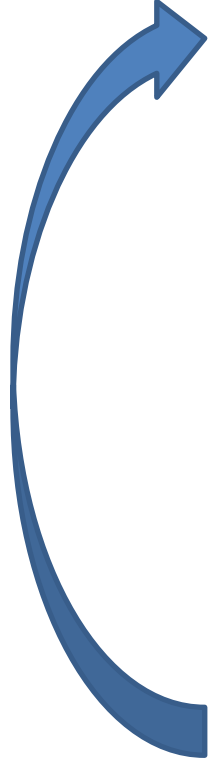
2012 RMP Annual Meeting

Meg Sedlak and Jay Davis

The Universe of CECs to Monitor



How are we deciding which CECs to monitor?

- 
1. Identifying CECs to monitor by:
 1. Reviewing literature; Asking the experts
 2. Using cutting edge instruments
 3. Developing new bioanalytical techniques
 2. Quantifying CECs in the Bay
 3. Prioritizing based on thresholds
 4. Developing a CEC Strategy

1. Reviewing the literature; Asking the Experts

- Review the literature
 - Occurrence
 - Toxic
 - Persistent
 - Bioaccumulative
- Emerging Contaminant Workgroup

Identifying New Persistent and Bioaccumulative Organics Among Chemicals in Commerce

PHILIP H. HOWARD*¹ AND
DEREK C. G. MUIR²

SRC, Environmental Science Center, 6502 Round Pond Road, North Syracuse, New York, and Aquatic Ecosystem Protection Research Division, Environment Canada, 867 Lakeshore Road, Burlington, Ontario

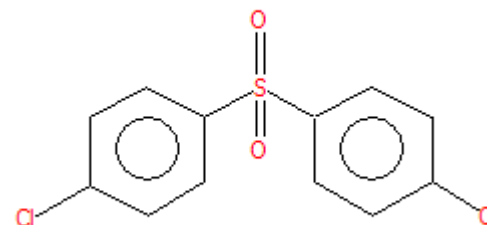
Received November 6, 2009. Revised manuscript received January 19, 2010. Accepted January 22, 2010.

The goal of this study was to identify commercial chemicals that might be persistent and bioaccumulative (P&B) and that were not being considered in current Great Lakes, North American, and Arctic contaminant measurement programs. We combined the Canadian Domestic Substance List (DSL), a list of 3059 substances of “unknown or variable composition complex reaction products and biological materials” (UVCBs), and the U.S. Environmental Protection Agency (U.S. EPA) Toxic Substances

610 Compounds

2. Using Cutting Edge Technologies

- Challenge to evaluate individual CECs
- New sophisticated instrument
 - Two-year RMP study with NIST to determine what is bioaccumulating in Bay seal and bivalve tissue
 - GC-GC TOF – not your grandmother's GC
- Large libraries to identify compounds
 - NIST library plus Howard and Muir list
- Report available early 2013



Dichlorodiphenylsulfone
On Howard and Muir List

3. Developing State of the Art Bioassays



- Broad, nontargeted approach to identifying classes of biologically active compounds

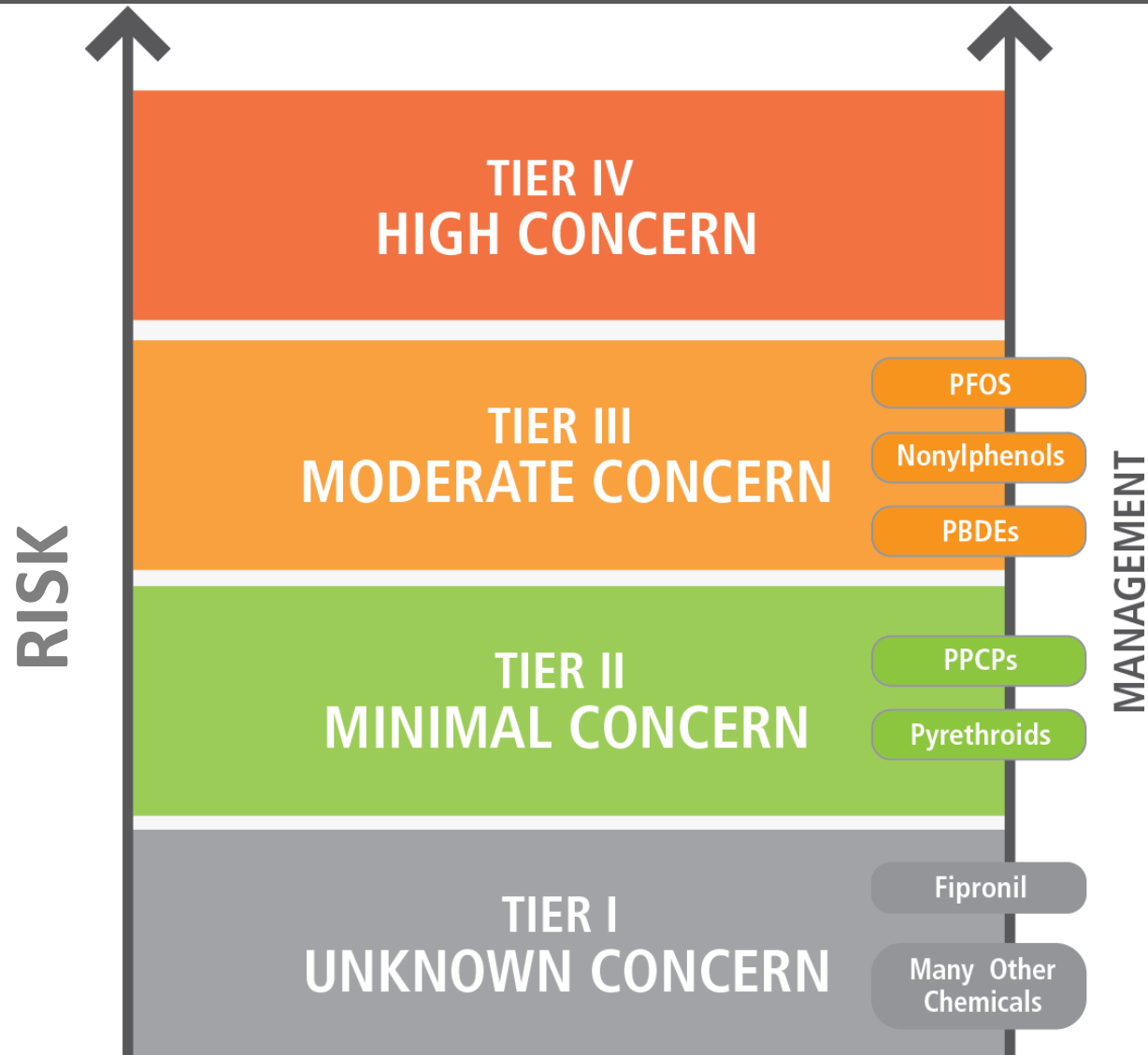


- Linking cell effects to effects in fish
- 2013 RMP study – 2 year project
 - Estuarine fish and EDC compounds

Examples of CECs Evaluated by RMP

- Pharmaceuticals and Personal Care Products
 - Alkylphenols
 - Alternative flame retardants
 - Perfluorinated chemicals
 - Current use pesticides
 - Chlorinated paraffins
-
- Summarized in CEC Synthesis document

Tiered Prioritization



CA State Panel Report



Monitoring Strategies for Chemicals of Emerging Concern (CECs) in California's Aquatic Ecosystems

Recommendations of a Science Advisory Panel

April 2012

Paul D. Anderson
Nancy D. Denslow
Jörg E. Drewes
Adam W. Olivieri
Daniel Schlenk
Geoffrey I. Scott
Shane A. Snyder

RMP SC Member



RMP WG Member



State Panel List for Estuaries

Table 1. CECs identified by the Advisory Panel for monitoring in coastal embayments

Surface waters	Sediments	Tissue
17-beta estradiol (hormone)	✓ Bifenthrin (pesticide)	✓ PBDEs 47, 99 (flame retardants)
Estrone (hormone)	✓ Permethrin (pesticide)	✓ PFOS (PFC)
Bisphenol A (PPCP)	✓ PBDEs 47, 99 (flame retardants)	
HHCb - Galaxolide (PPCP)	✓ PFOS (PFC)	
✓ Bifenthrin (pesticide)		
✓ Permethrin (pesticide)		
✓ Chlorpyrifos (pesticide)		

✓ Evaluated by the RMP

PFOS

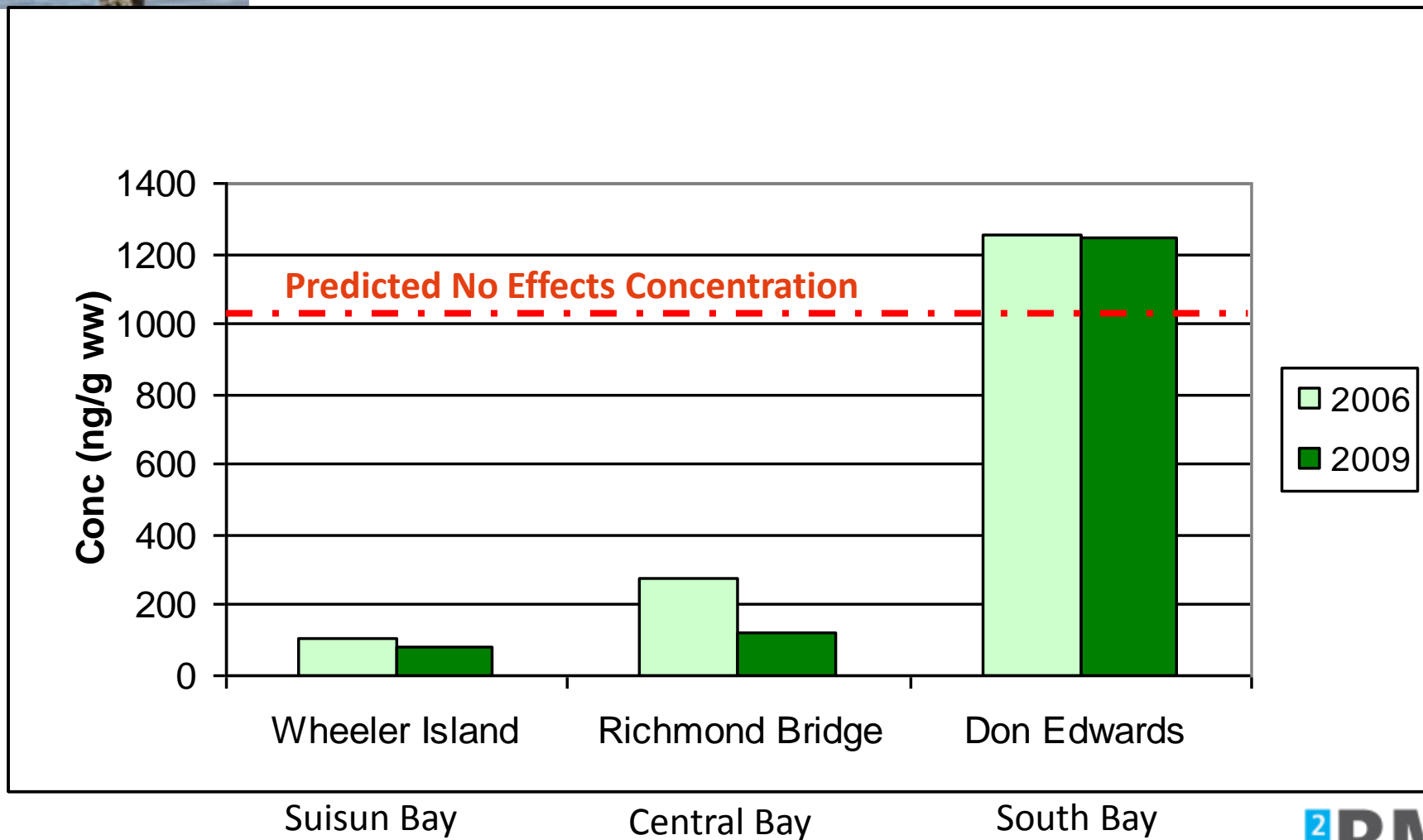


- Perfluorooctane sulfonate
- Use
 - Wide variety of applications
 - Withdrawn from US market in 2002
 - Large reservoir from historic use and precursors
- Toxic
 - Developmental toxicity, compromised immune systems, and endocrine disruptor
- Detected in Bay sediments, water, storm water, seals and bird eggs





PFOS in Bird Eggs



Suisun Bay

Central Bay

South Bay

Rationale for Classification

- Concentrations > effects threshold
- Detected in apex predators with no indication of decline
- Sources to the Bay not known
- Further elucidation 2012 PFC Study
 - Sediment, small fish, bird eggs, and seals

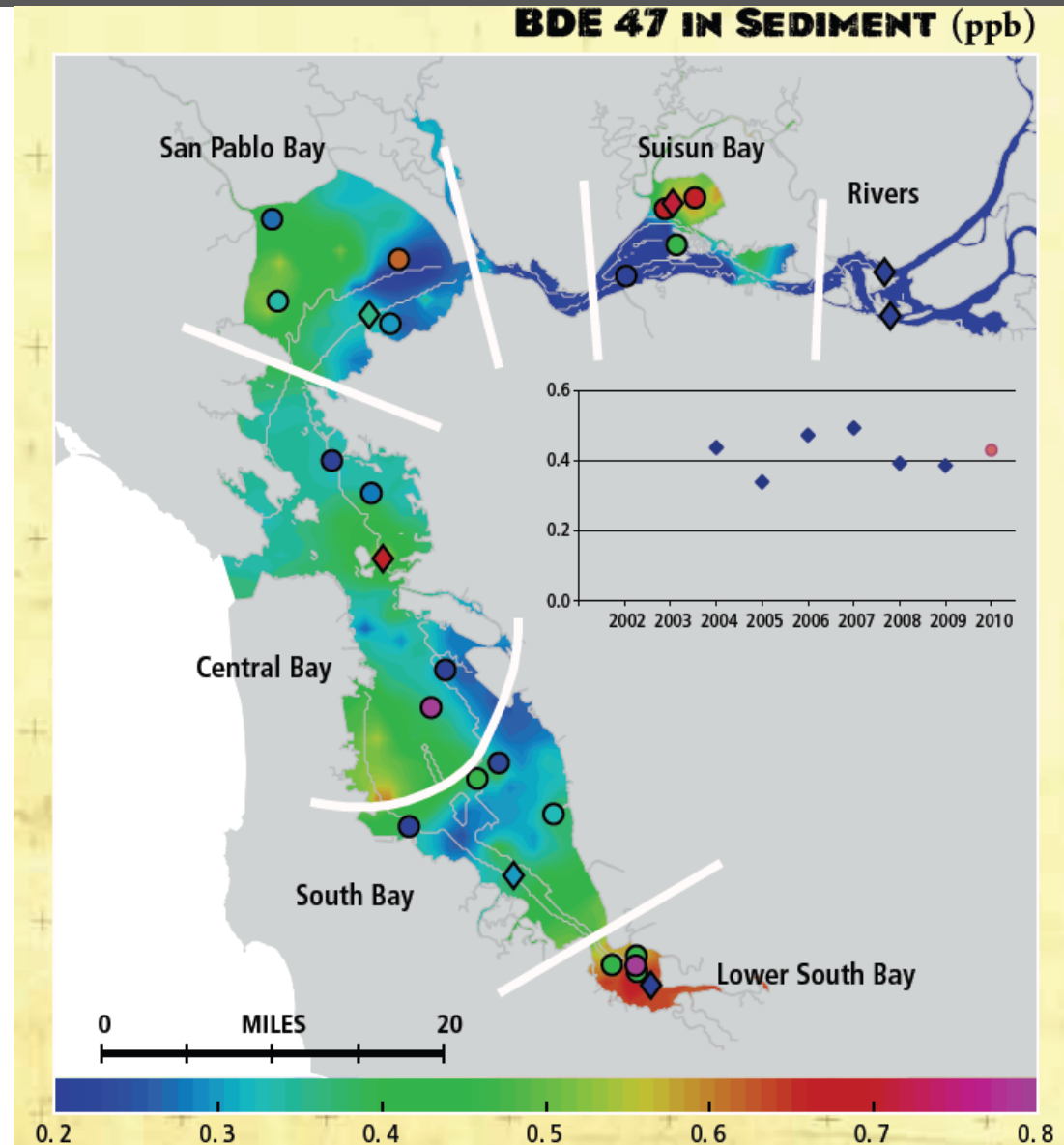


PBDEs – A Success Story

- In 2002, PBDEs were

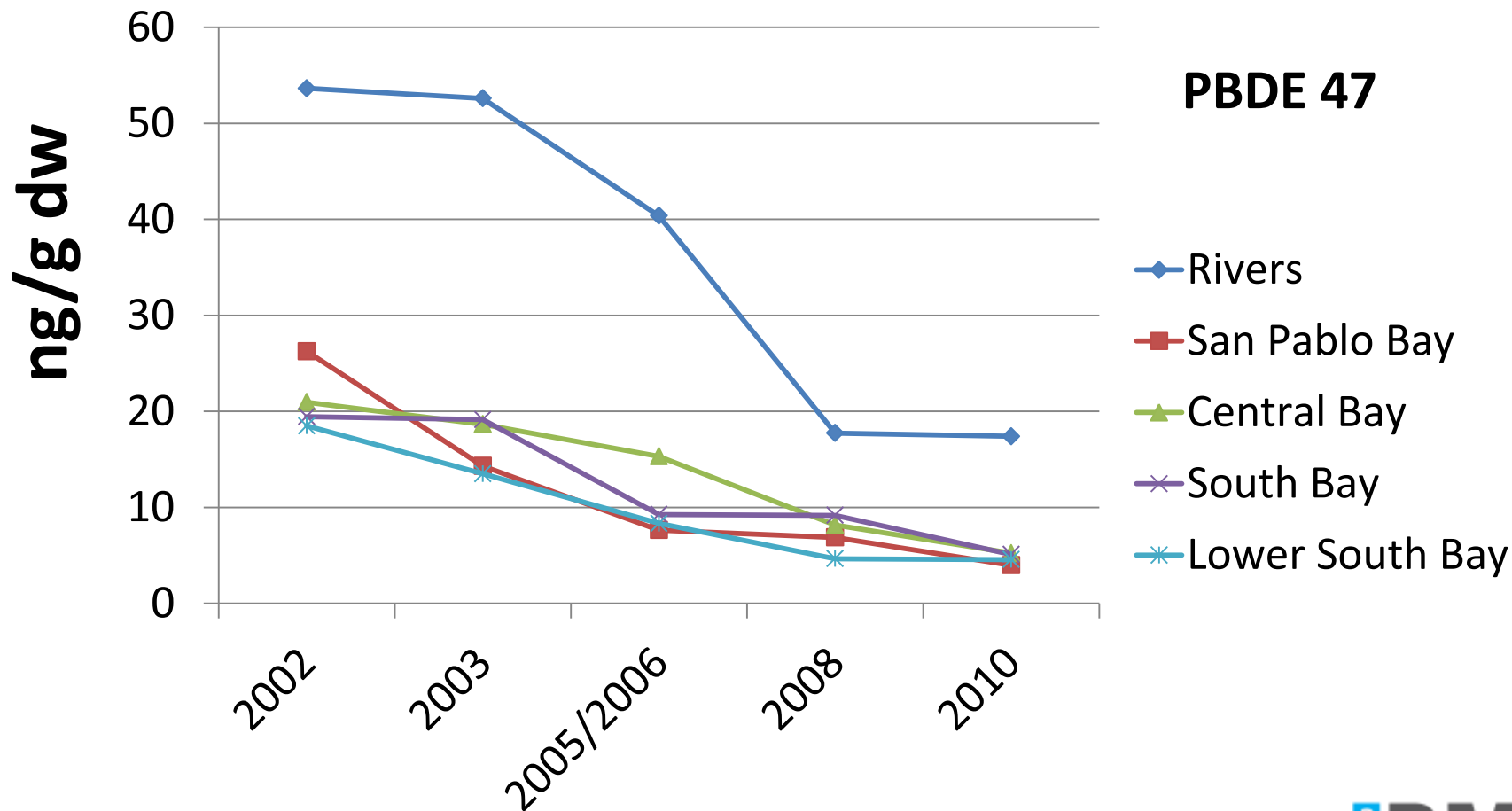
TIER I
UNKNOWN CONCERN

- Phase-out of Penta and Octa in 2006;
Deca by 2013



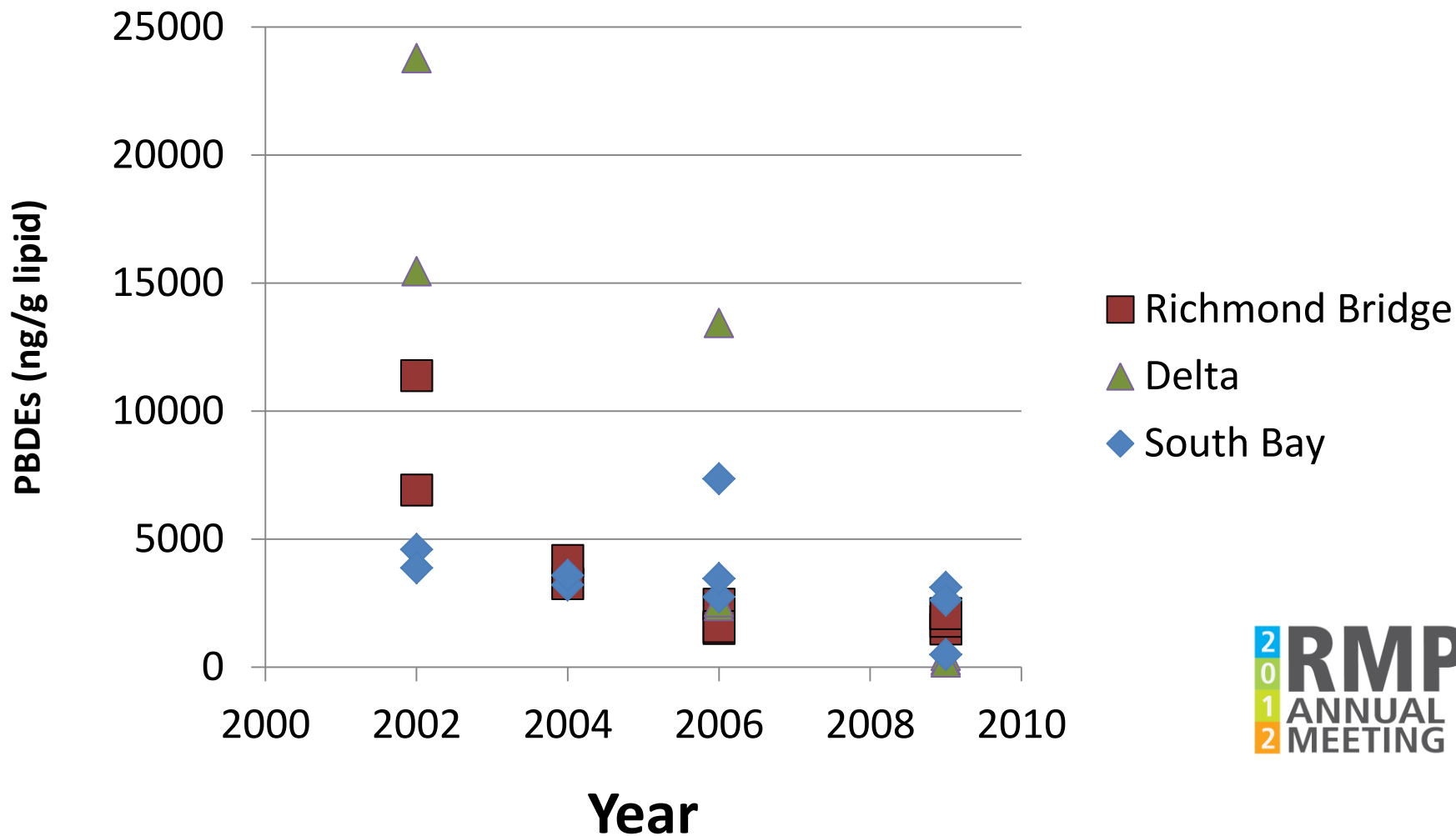


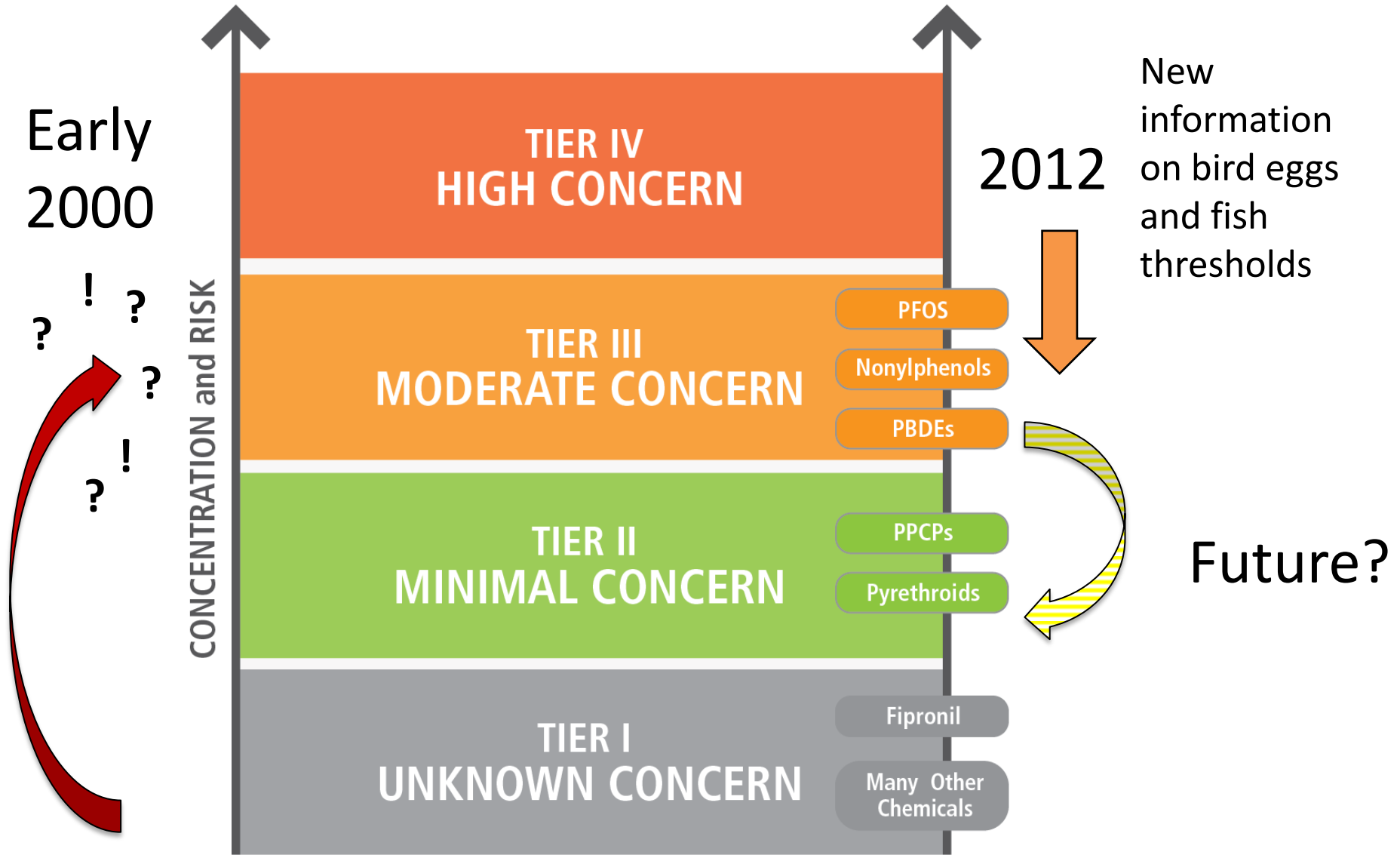
PBDEs in Bivalves





PBDEs in Cormorant Eggs





Fipronil



- Fipronil
 - Structural pest control, landscaping, and consumer products
 - CA use almost doubled (2003 – 2008)
- RMP monitoring in Bay sediment
 - 1 to 56 ng/g OC
 - Sediment toxicity to midge
 - LC-50 130 ng/g OC (Maul 2008)
- No information on Bay water
 - Urban runoff in Sacramento/Orange County exceeds toxicity thresholds (Gan et al. 2012)

Alt. Flame Retardants

Chlorinated phosphates

	High Vol?	Prop 65?	Sediment	Biota
TDCPP*	Yes	Yes	✓	ND
TCPP*			✓	ND
TCEP		Yes	??	✓
TBEP			??	✓
TPP*	Yes		✓	✓
Deca PBDE replacements				
DBDPE*	Yes		ND	??
BTBPE*	Yes		✓	ND
Penta PBDE replacements				
TBPH*	Yes		ND	??
TBB	Yes		ND	ND?
PBEB*			✓	✓
DP*	Yes		✓	✓

Chris Werme article



* On Howard and Muir 610 list

CEC Strategy: Next Steps

- Articulate a strategy for CECs in upper tiers and unknown tier
- Incorporate “New” CECs
 - Review results of NIST study (early 2013)
 - Update prioritization table with new information as it comes available

2013 State of the Estuary & RMP Annual Meeting

- Combined meeting in downtown Oakland
- Focus on Contaminants of Emerging Concern
 - Latest RMP results
 - Leading scientists
 - Regional Board CEC policy
 - Green Chemistry Initiative update

Many Thanks!



- Paul Salop, Applied Marine Sciences and AXYS Analytical
- RMP Data Management Staff
 - Amy Franz, Adam Wong, Cristina Grosso, and John Ross
- Emerging Contaminant Workgroup
 - Derek Muir, Lee Ferguson, Jen Field, and David Sedlak
 - Karin North, Tom Mumley, Naomi Feger, Eric Dunlavey, Eva Agus, Mike Connor, Denise Greig, Ian Wren, and Keith Mayura
- Chris Werme

