

# Pilot Monitoring of CECs in California via the Mussel Watch Program

Nathan Dodder

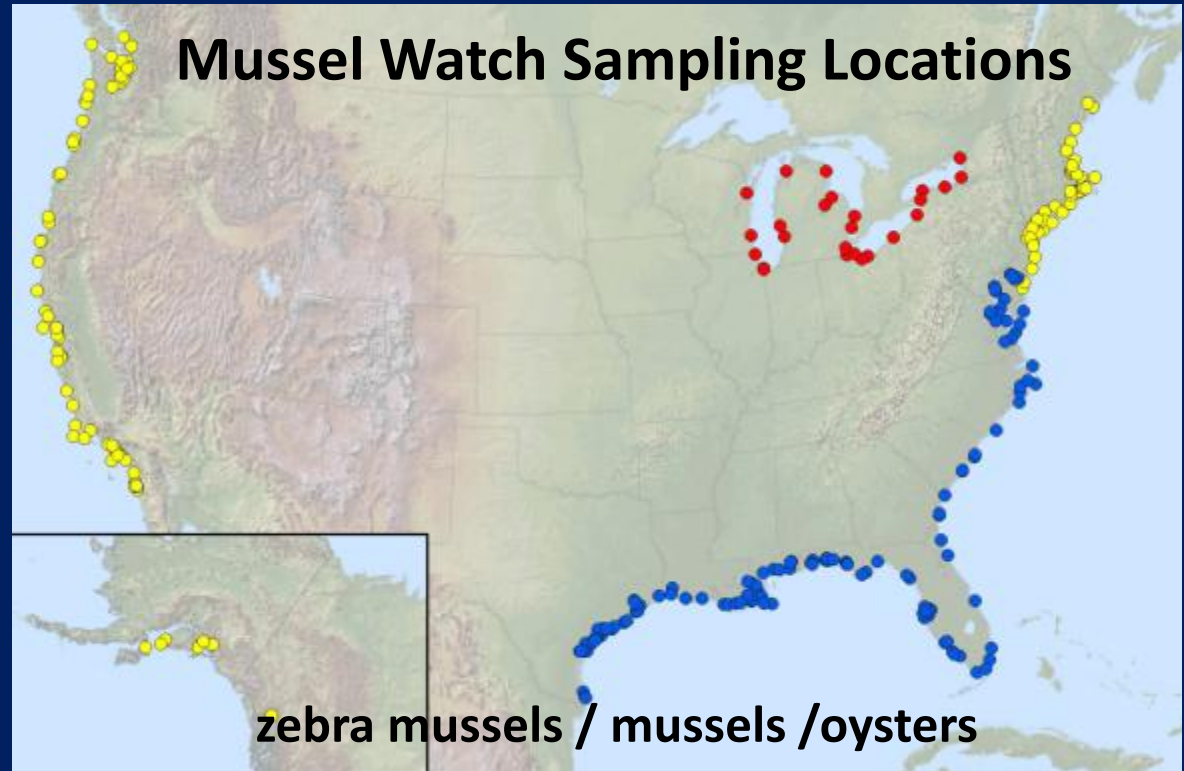
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# NOAA Mussel Watch Program

## Purpose

- collect occurrence data on coastal contaminants and monitor temporal trends
- in operation 1986 - 2008



## Spatial distribution

- 145-300 sites along US coast and Great Lakes

## Measured contaminants

- Approximately 140 legacy contaminants including PCBs, DDT, other pesticides, PAHs, and trace metals.

# Bivalves as Contaminant Samplers

## Bivalves

- filter-feeders
- bioaccumulate contaminants in their tissues
- indicators of local contamination

## Deployment

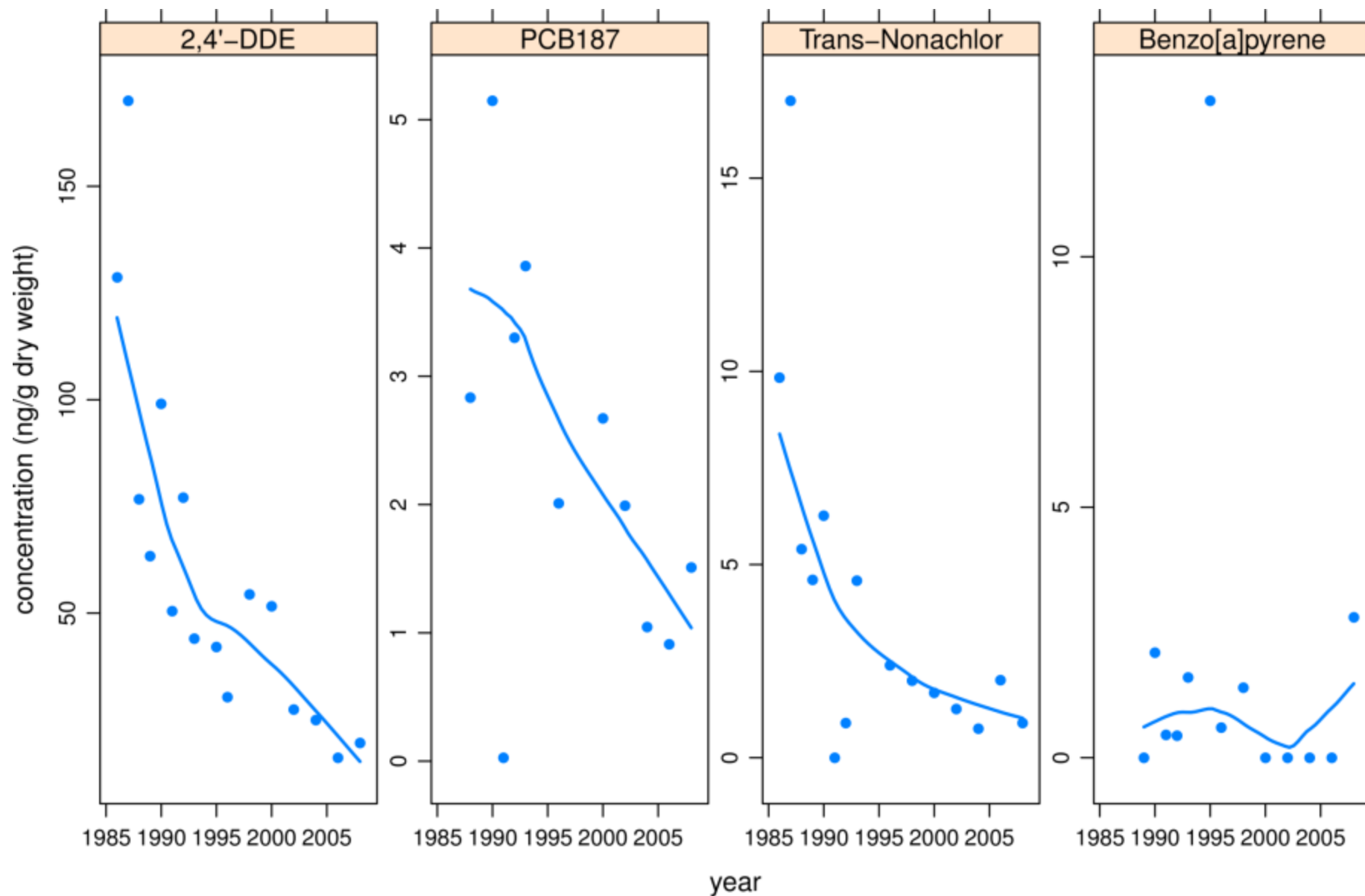
- native bivalves are collected
- caged bivalves are deployed

## Analysis

- tissue extraction followed by instrumental analysis
- GC-based methods for organic contaminants



# General Decline in Legacy Contaminants - Palos Verdes



# Pilot Monitoring of CECs in California

The SCCWRP Commission identified a lack of CA CEC data.

## Goal of pilot

- determine the occurrence of contaminants of emerging concern
- suggest compounds for inclusion in future Mussel Watch surveys (nation-wide)
- suggest compounds for further investigation in CA waters

## Selection of analytes (207 CECs total)

- reported in the literature with a likelihood of occurring in CA waters
- available robust analytical methods (GC/MS and LC/MS/MS)

## Timeline

- samples collected in 2010 and analyzed in 2011

# Pilot Study Questions

## **What are the most abundant CECs?**

- Can future monitoring focus on a prioritized list CECs?

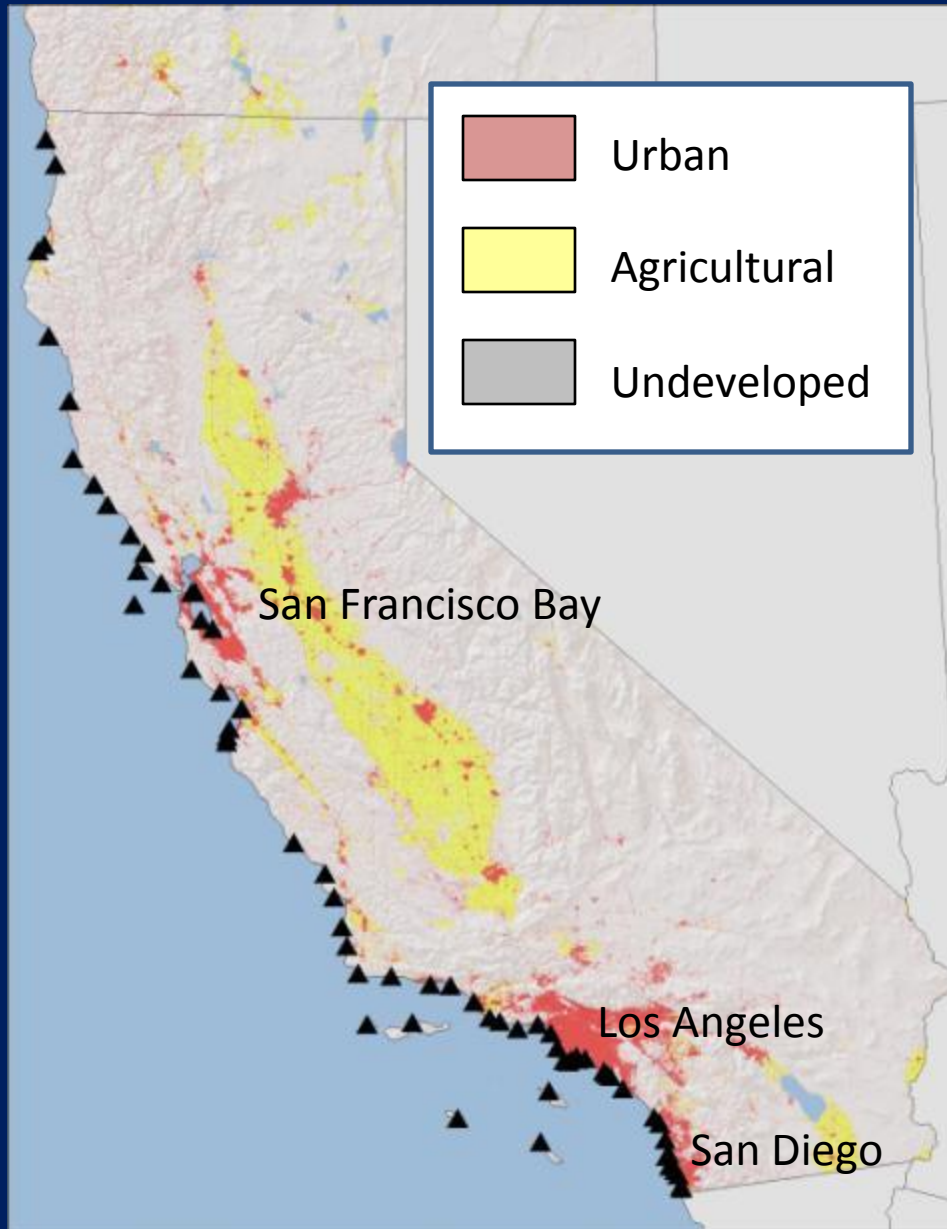
## **What habitats/regions are the most impacted?**

- How do urban and rural regions compare?
- What is the impact of POTWs and stormwater?

## **Do urban areas have the same contaminant profile?**

- Are CECs are generic management problem, or a specific management problem depending on the area?

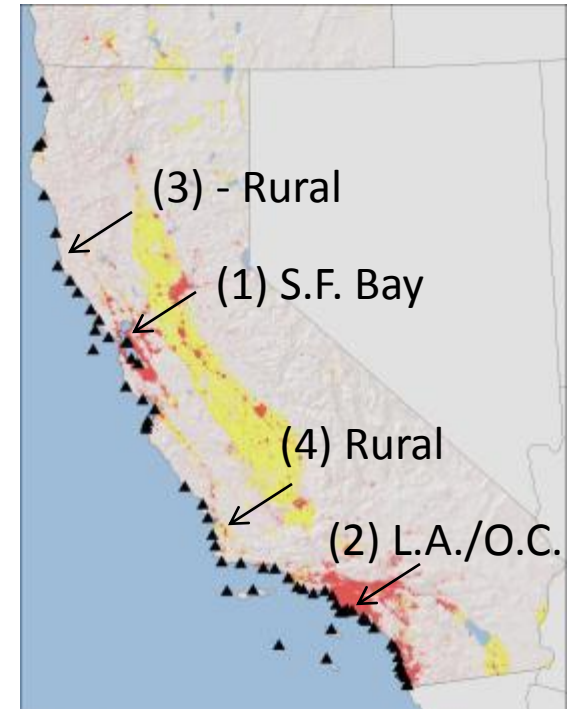
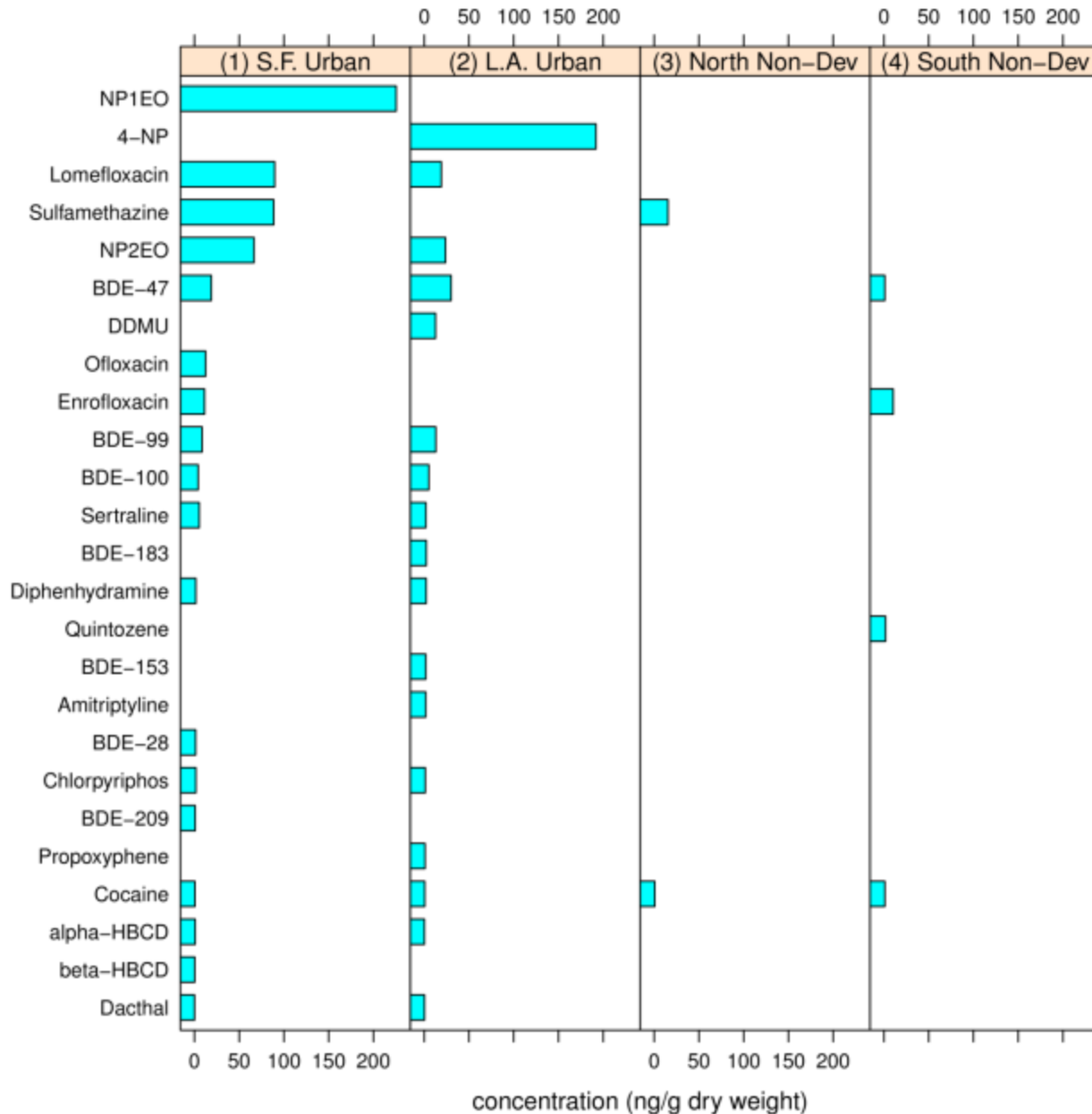
# Pilot Study Site Selection



Land Use	Number
Urban	29
Undeveloped	31
Agricultural	8

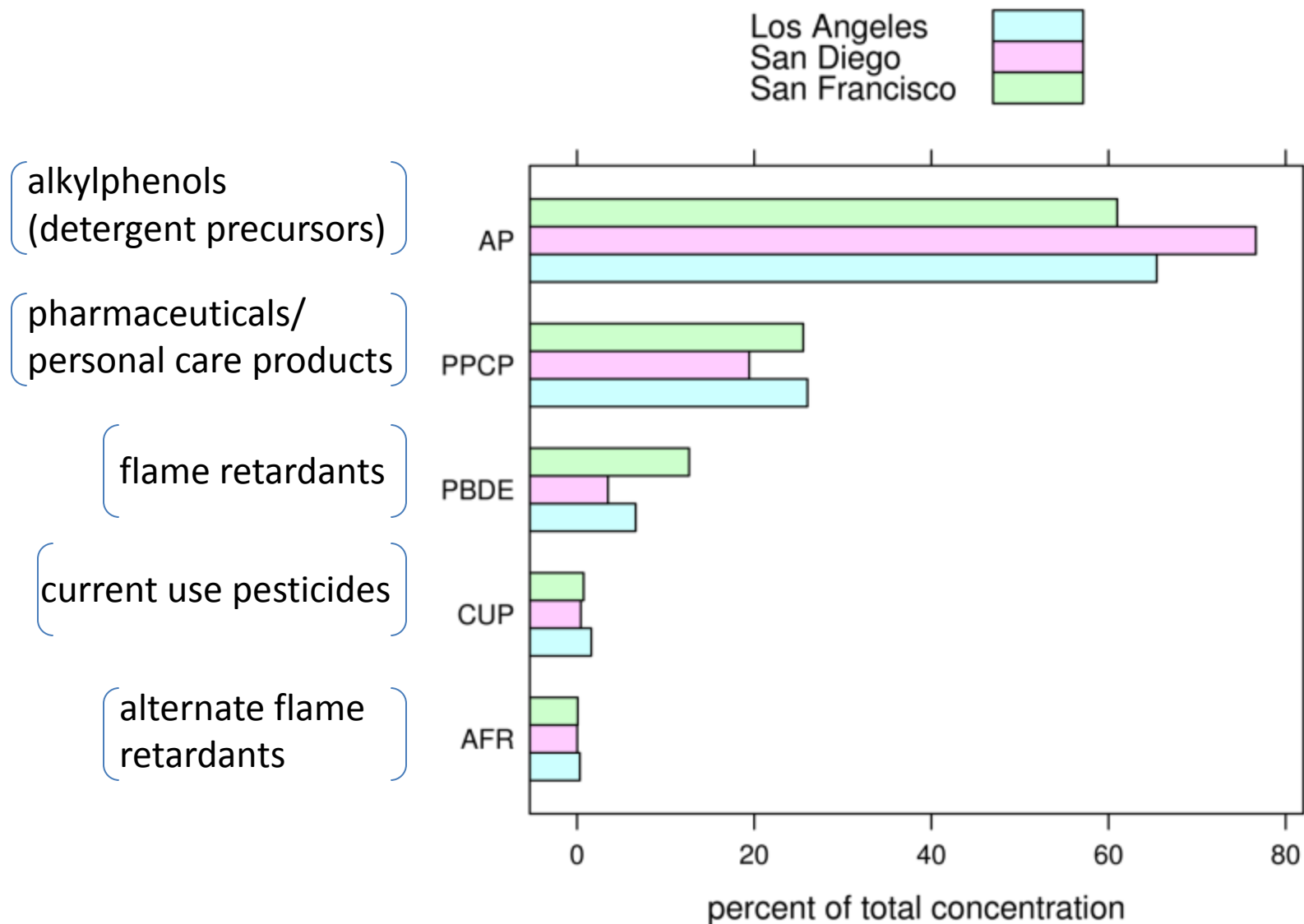
Category	Number
POTW Discharge	21
Stormwater	25
ASBS	23

# CECs by Land Use





# CECs in SF Bay and Southern California Urban Areas



CECs have consistent urban profiles. These are “background” urban levels not associated with major industrial point discharges.

# Abundant CECs in CA Mussel Tissues

Most abundant contaminants within each use category

compound	use	max	percent detected	mean
4-Nonylphenol	detergent precursor	270	21	12
Sulfamethazine	veterinary antibacterial	87	35	4.1
Methylprednisolone	pharmaceutical	31	15	2.5
Caffeine	stimulant	23	19	2.2
BDE-47	flame retardant	14	84	1.1
Dacthal	pesticide	7.0	37	0.4

concentrations in ng/g dry weight

- 149 of 207 CECs were detected in mussel tissue
- variety of uses/sources
- variety of physical/chemical properties

# CEC Occurrence Data - Summary

## Spatial distribution

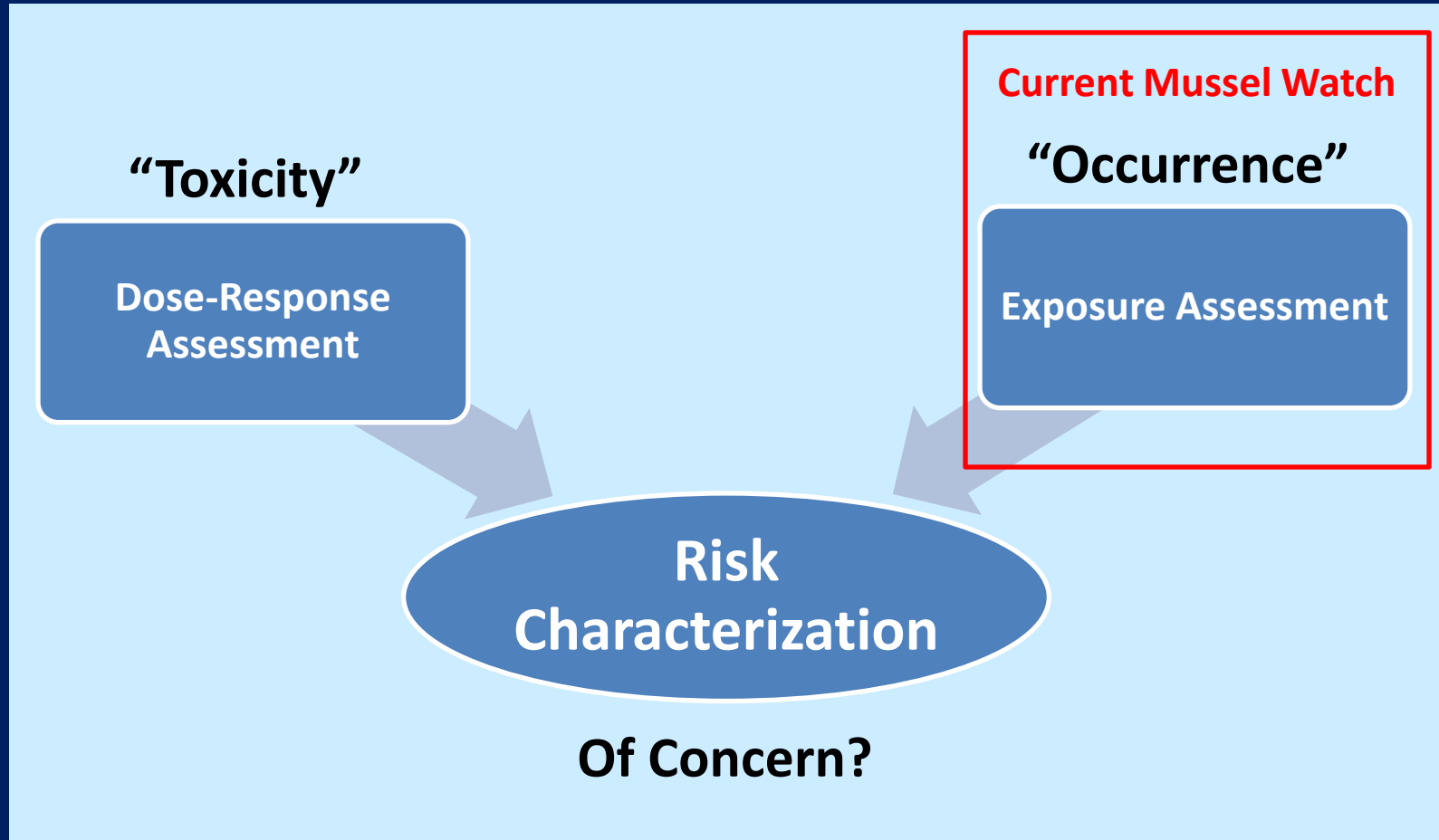
- CECs were more abundant in urban areas but detected in all but one of the sampling sites
- a wide variety of CECs were detected

## Occurrence of specific contaminants

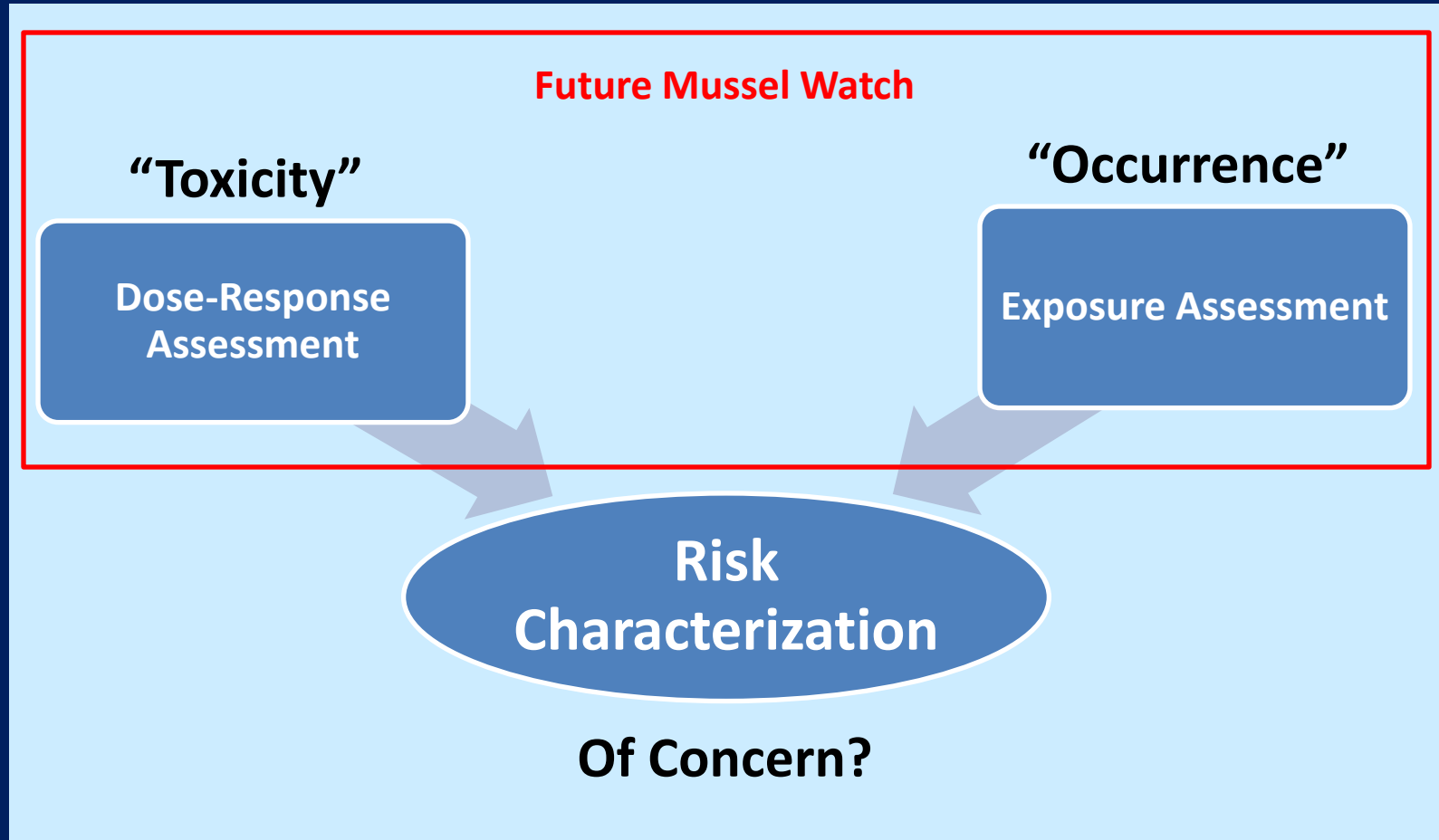
- first-of-its-kind data for California coastal waters at this spatial scale and number of CECs
- can be used to suggest a prioritized list of CECs for future Mussel Watch surveys or California-specific monitoring

**Do these CECs have a negative ecological effect?**

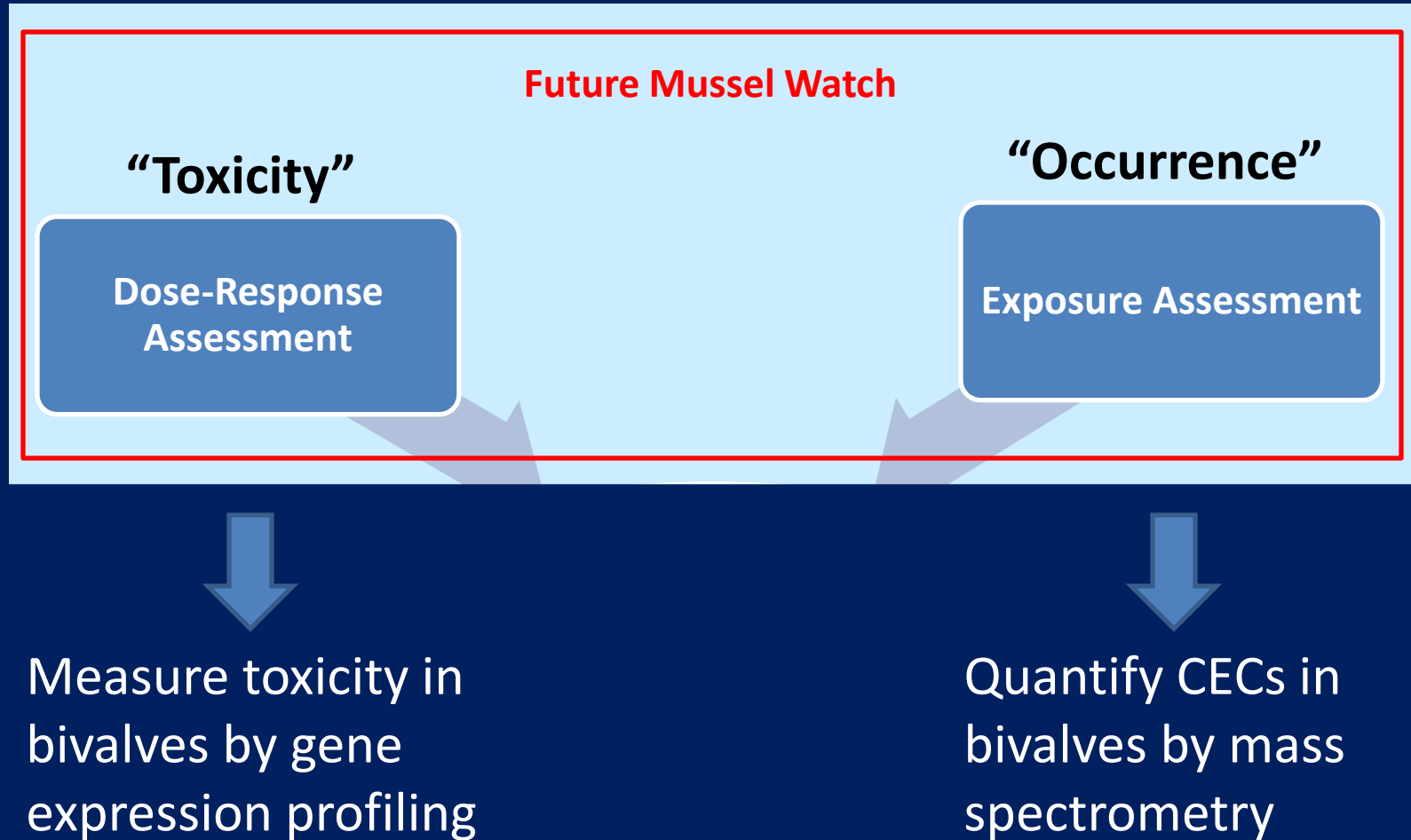
# Future Work – Mussel Watch as a Bio-Indicator Platform



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# Future Monitoring Methods - Passive Samplers

## Bivalves

- significant logistics/regulations/cost
- cannot be deployed in freshwater

## PS Mechanism of Operation

- diffusion transports contaminants to a sorbent material
- mimics the exposure of aquatic organisms
- different sorbent materials target various chemical classes



# Thank You

## **SCCWRP:**

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## **External Collaborators:**

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San Francisco Estuary Institute (SFEI)

State Water Resources Control Board (SWRCB)

AXYS Analytical

Duke University

TDI / Brooks

Virginia Institute of Marine Sciences (VIMS)