

# Emerging contaminants in NC rivers: Strategies for protecting water quality

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On behalf of the NC Coastal Federation

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# Unlisted emerging contaminants in drinking water sources

- When chemicals are not included in priority pollutant lists, there are no water quality standards and monitoring is not routinely performed.
- Safe Drinking Water Act provides for priority contaminant monitoring (53 organic chemicals) and emerging contaminant prioritization (Contaminant Candidate List – currently includes 97 chemicals).
- EPA decides which chemicals are priorities for monitoring and future regulation.
- Which chemicals are “emerging”? Which pose risks to human health?

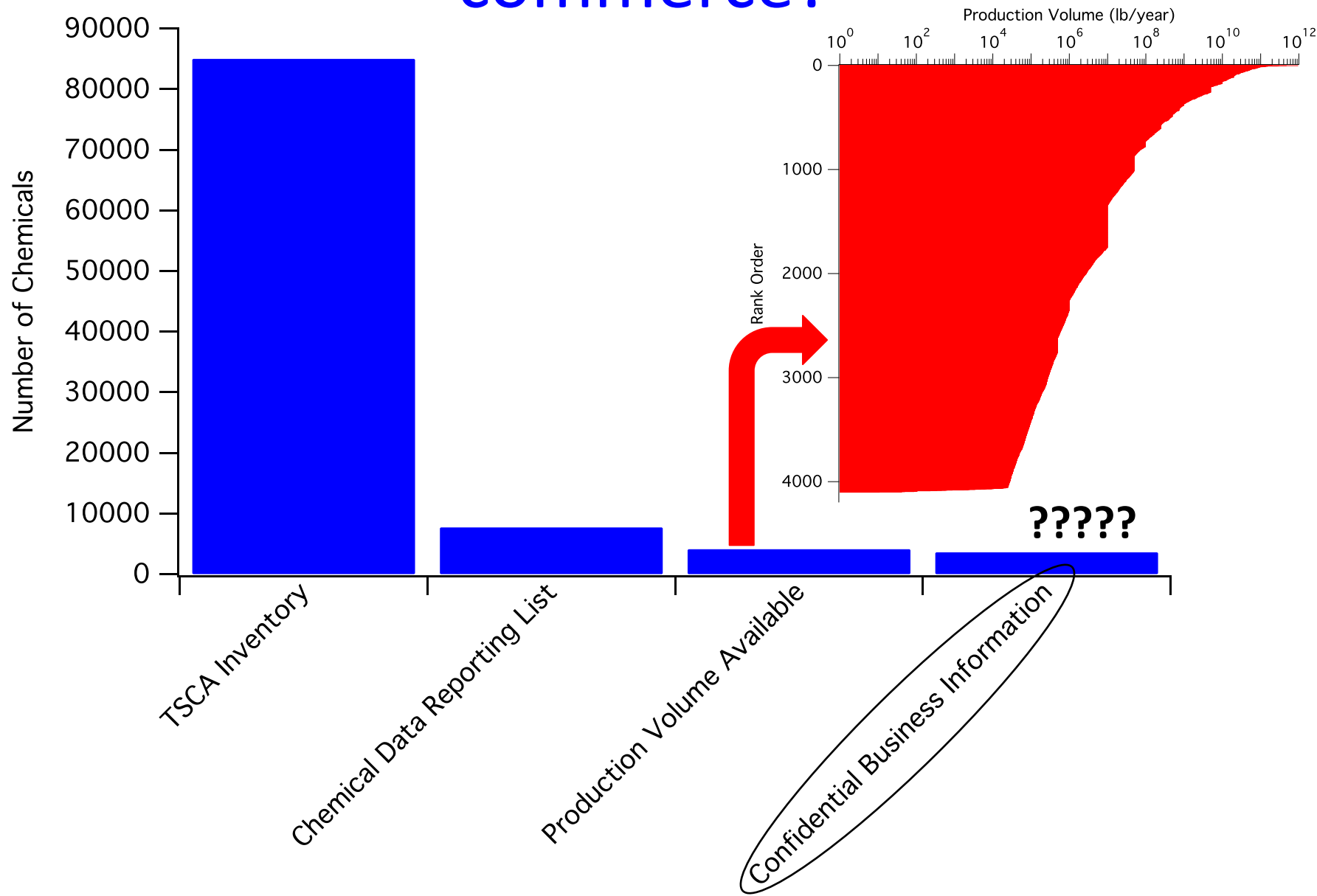
# How do we avoid another GenX situation in NC waters?

- The only way to avoid being taken by surprise with unlisted (non-priority designated) emerging contaminants is to monitor for them.
- “Holistic” emerging contaminant monitoring in water is not routine. State labs do not have this capability currently.
- There are two approaches for anticipating emerging contaminant problems in water:
  - Top Down: Know which chemicals in commerce are potentially problematic, and monitor for those in water.
  - Bottom Up: Extensively monitor drinking water sources for the presence, identity, and levels of pollutants

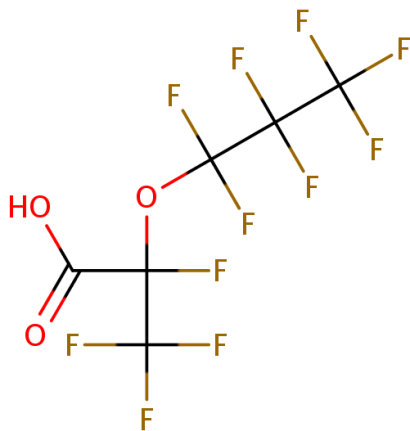
# Top Down: Can we tabulate risky chemicals from regulatory lists?

- Our chemical universe:
  - How many chemicals exist? ~ 80-130 million
  - How many chemicals are used in commerce? ~ 85,000 (TSCA)
  - How many chemicals have been tested for toxicity? < 10,000 (hard to tabulate)
  - How many chemicals are flagged as “priority pollutants” under CWA? 126
  - How many chemicals are flagged as “toxic pollutants” under CWA? 65
  - How many chemicals have been banned by EPA? 9 (PCBs, dioxins, chlorofluorocarbons, asbestos, hexavalent chromium, and four carcinogenic mixed nitrates used in metalworking)

# Which chemicals are highly used in commerce?



# Example: What can we find out about GenX from EPA TSCA inventory data?



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Chemical Name:  
**TSCA § 12(b) Export Notification** CAS #:  
2,3,3,3-Tetrafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)propanoic acid 13252-13-6

EPA Actions

TSCA § 5 Orders  
[CO](#)

Chemicals Subject to TSCA § 12(b) Export Notification  
[TSCA § 12\(b\) information](#)

Manufacturing, Processing, Use, and Release Data Maintained by EPA

Chemical Data Reporting  
[CDR Summary](#)

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### TSCA SECTION 5 ORDER

[View TSCA Section 5 Order](#)

Chemical Name: 2,3,3,3-Tetrafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)propanoic acid  
Chemical Identifier: 13252-13-6  
Effective Date: January 28, 2009  
Chemical Category: PBT chemicals

What type of TSCA Section 5 Order was developed for this chemical substance?

- Exposure-based
- May present an unreasonable risk

TSCA Section 5 Order for: 2,3,3,3-Tetrafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)propanoic acid , 13252-13-6

PMN Number: P-08-0508

Has the chemical been commenced?: Yes

Functional Use: Intermediate for polymerization aid (generic)

What are the health or environmental toxicity concerns?

- Aquatic and/or terrestrial toxicity
- Cancer effects
- Developmental/reproduction
- Internal organs (e.g., liver, blood, kidney, etc.)/systemic toxicity
- Lung toxicity (including lung overload)
- Mutagenicity
- Persistent, Bioaccumulative, Toxic (PBT) properties

What is the basis for the health or environmental toxicity concerns?

- Analog data
- PBT chemicals

# Example: What can we find out about GenX from EPA TSCA inventory data?

“The Chemical Data Reporting (CDR) Rule, issued under the Toxic Substances Control Act (TSCA), requires manufacturers (including importers) to give EPA information on the chemicals they produce domestically or import into the United States. EPA uses the data to help assess the potential human health and environmental effects of these chemicals and **makes the non-confidential business information it receives available to the public.**”

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## Chemical Data Reporting (CDR)

Propanoic acid, 2,3,3,3-tetrafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)-

CAS Number 13252-13-6

National Aggregate Production Volumes:  
2015: Withheld  
2014: Withheld  
2013: Withheld  
2012: Withheld  
2011: Withheld

Download this CDR Data

Parent Company and Company Site	2012 CDR Data	2016 CDR Data	2015 Activity	2010 Production Volume (lb)	2011 Production Volume (lb)	2015 Consumer and/or Commercial Use?	2015 Used in Products Intended for Children?
E I DU PONT DE NEMOURS & CO Site : DUPONT FAYETTEVILLE PLANT,22828 Nc Highway 87 West,Fayetteville,Bladen,NC,28306-7332 CBI	<a href="#">View Data</a>			CBI	CBI		
Site : THE CHEMOURS COMPANY FC, LLC (FAYETTEVILLE WORKS),22828 Nc Highway 87 West,Fayetteville,Bladen,NC,28306		<a href="#">View Data</a>	Domestically Manufactured				

**Legend**

CBI	Data claimed as Confidential Business Information
Withheld	Data fields labeled as 'withheld' are either masked to protect CBI claims, or currently undergoing a <a href="#">CBI substantiation process</a>
Production Volume	Production volume includes domestically manufactured and imported volumes
Commercial	The use of a chemical substance or mixture in a commercial enterprise providing saleable goods or services
Consumer	The use of a chemical substance or mixture when sold to or made available to consumers for their use

## Top Down chemical prioritization: What do we need to prevent GenX situation?

- More information on which chemicals in commerce are produced and used, with location.
- Full production-volume information on chemicals in commerce (all chemicals on TSCA list).
- Relief from Confidential Business Information (CBI) disclosure limits: must be made available to researchers outside US EPA.



# Bottom Up: Why is it hard to identify emerging contaminants early?

## Strategies for analytical characterization of emerging contaminants

Screening technique:	<i>Targeted</i>	<i>Suspect</i>	<i>Non-target</i>
Question:	<i>Are compounds x, y, &amp; z present in this sample?</i>	<i>Which compounds of a defined list are present in this sample?</i>	<i>Which compounds are present in this sample?</i>
Compound Types:	<i>Known-knowns</i>	<i>Known-unknowns</i>	<i>Known-unknowns &amp; unknown-unknowns</i>



"There are known knowns; there are things we know we know. We also know there are known unknowns; that is to say we know there are some things we do not know. But there are also unknown unknowns – the ones we don't know we don't know."

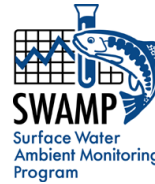
# Challenges for routine Bottom Up analysis of emerging contaminants

- “Non-Targeted” analysis of emerging contaminants relies on very specialized analytical instrumentation.
- The high resolution mass spectrometers needed are not available in most state monitoring labs (~ \$1,000,000 capital cost).
- Standard methods are not deployed for performing “Non-Targeted” contaminant monitoring in ambient waters of NC.
- Expertise for such analysis is at research level.

# Bottom up analysis of non-priority pollutants in water CAN be done

- Several “Non-Targeted” emerging contaminant surveillance programs are in place within the US and Europe:
  - California EPA State Water Resources Control Board
  - San Francisco Bay Regional Monitoring Program
  - International Rhine River Monitoring Network (Canton of Basel, Switzerland)

# California State Water Resources Control Board



- California has implemented a state-wide emerging contaminant monitoring program.
- Incorporates risk-based screening as well as ambient monitoring.
- Collaboration of state regulatory agencies, local water boards, non-profit organizations, and academic researchers.
- Multi-Tier, science-based prioritization scheme for anticipating risks associated with emerging contaminants in water.

*Statewide Pilot Monitoring Plan*

2016

**Constituents of Emerging Concern (CECs)  
Statewide Pilot Study Monitoring Plan**

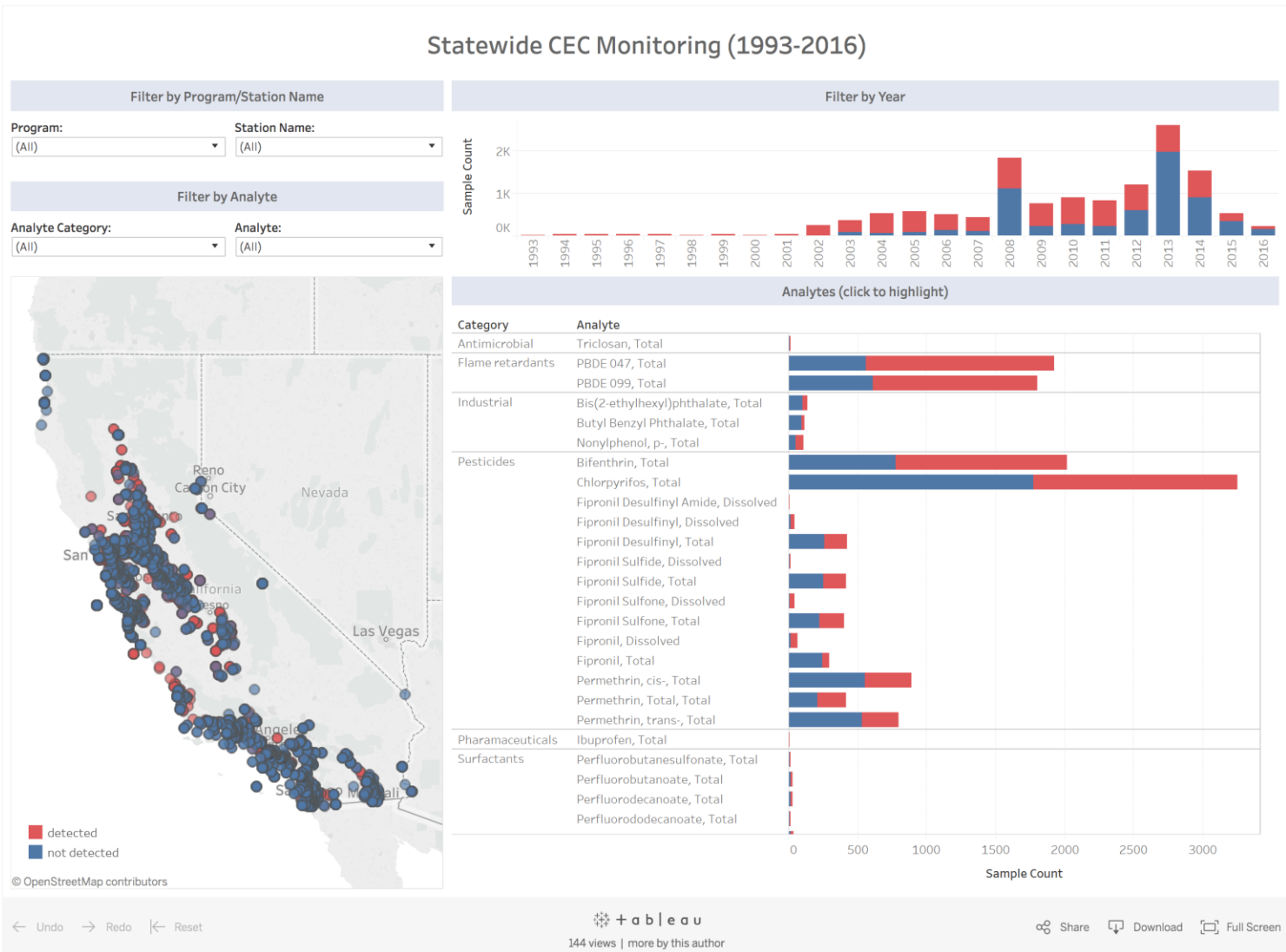
**Office of Information Management and Analysis**

**Dawit Tadesse**

January 2016



[www.waterboards.ca.gov/swamp](http://www.waterboards.ca.gov/swamp)



# Statewide CEC Monitoring Dashboard

152 views | [SWAMP OIMA](#)





**RMP**  
REGIONAL MONITORING  
PROGRAM FOR WATER QUALITY  
IN SAN FRANCISCO BAY

[sfei.org/rmp](http://sfei.org/rmp)

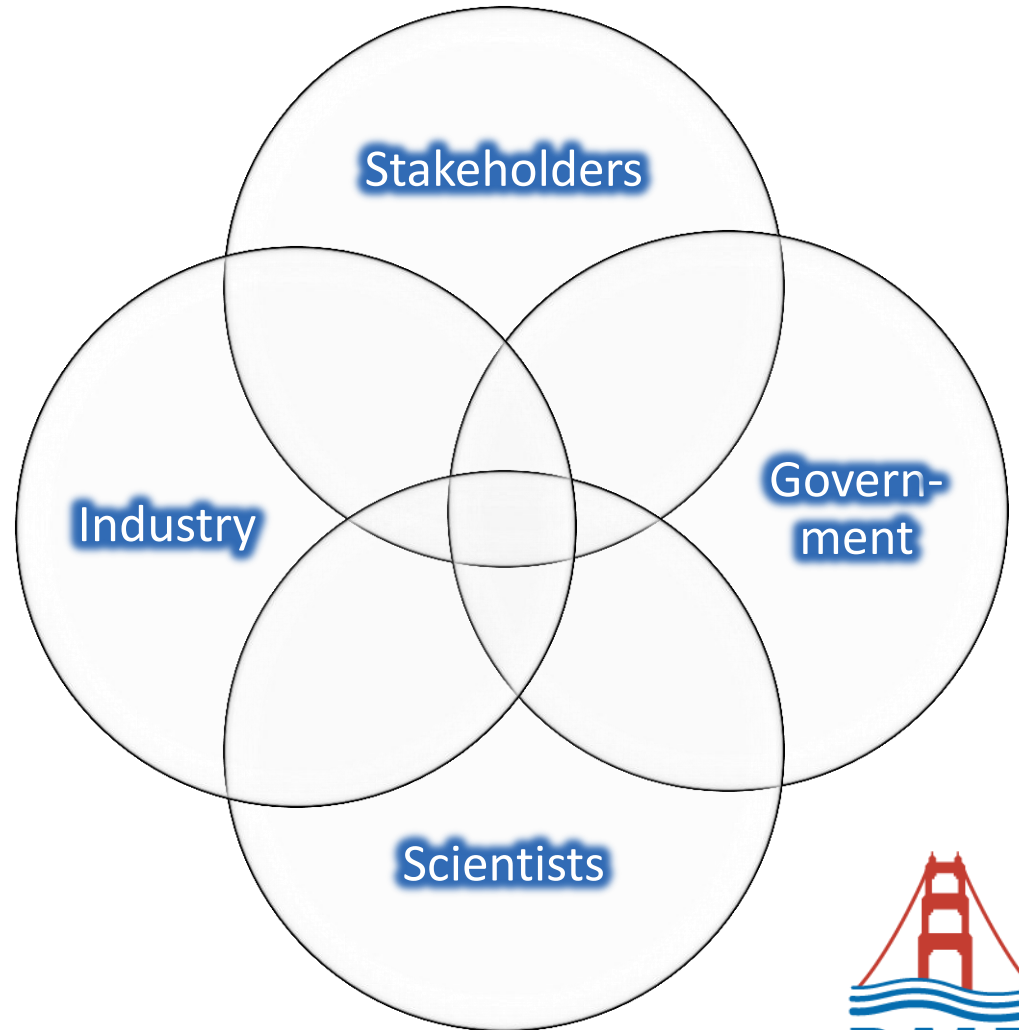
# Contaminants of Emerging Concern (CEC): The San Francisco Bay Story

Slides courtesy of:

Rebecca Sutton, San Francisco Estuary Institute  
– Aquatic Science Center

# Regional Monitoring Program

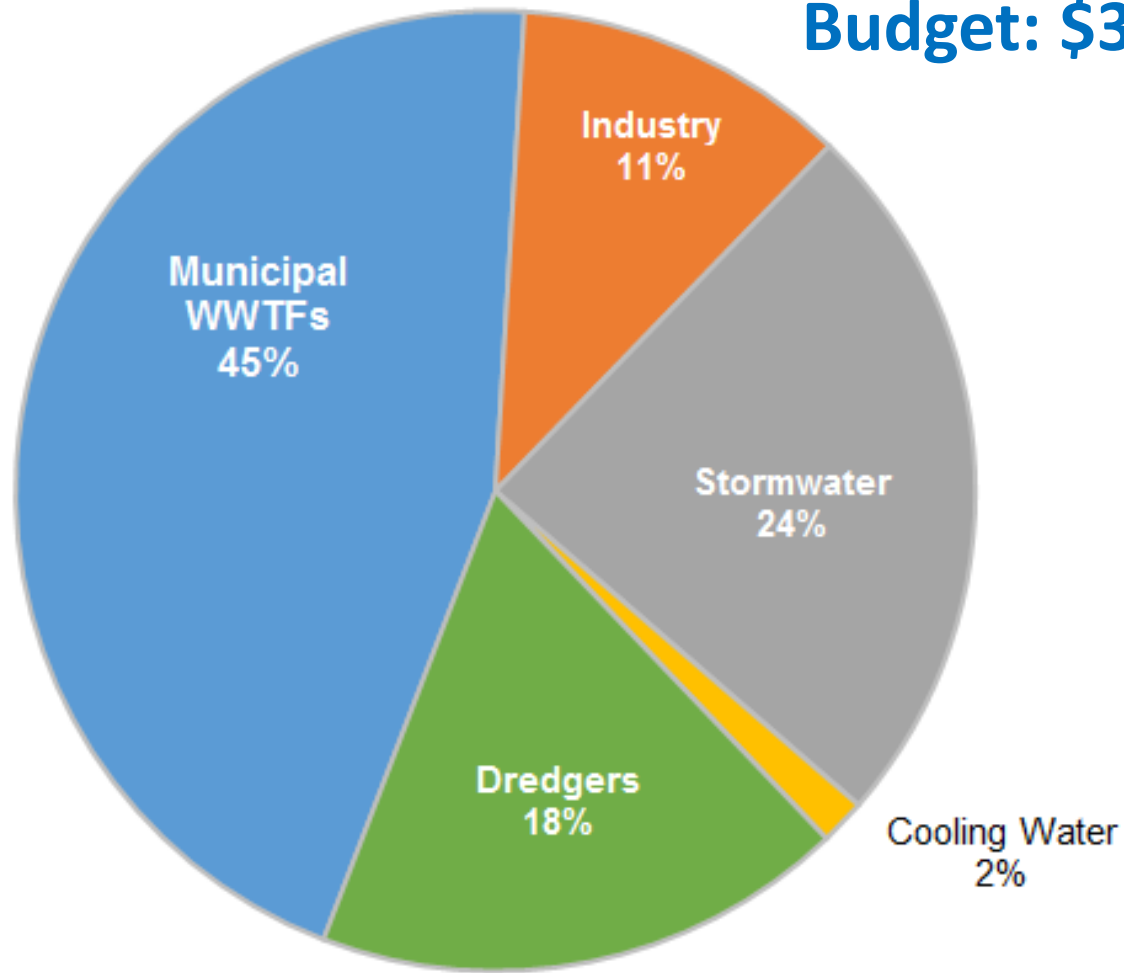
**Partnership** to  
understand the  
**health** of San  
Francisco Bay



# RMP Participants

RMP Fees by Sector: 2017

**Budget: \$3.5M**






# RMP Focus on CECs

- 10+ years of monitoring and studies
  - Primarily ambient water, sediment, biota
  - Some wastewater and stormwater
- 2013 CEC Synthesis and Strategy
  - Added non-targeted analysis, bioanalytical tools
- 2017 Strategy Revision



# An Overview...



**Monitoring Station**



# International monitoring network

## Warning and Alarm Plan

- 7 Headquarters
- 7 Monitoring stations

Threshold concentration levels [µg/L]		
	regional	international
Pesticides, Biocides, Pharmaceuticals	0.1	0.3
other Substances	1	3

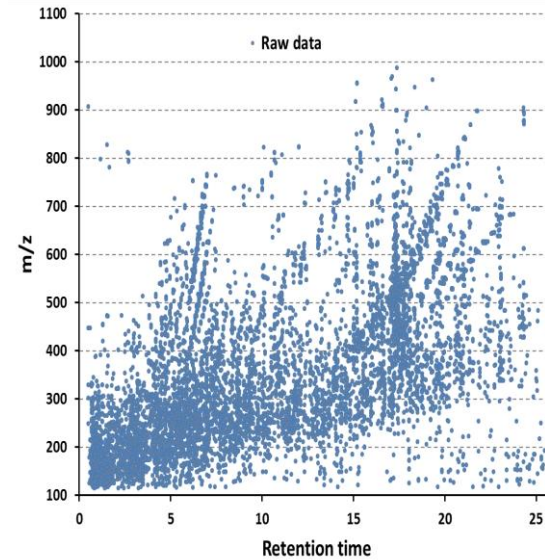


# Principle of using time series

Sampling



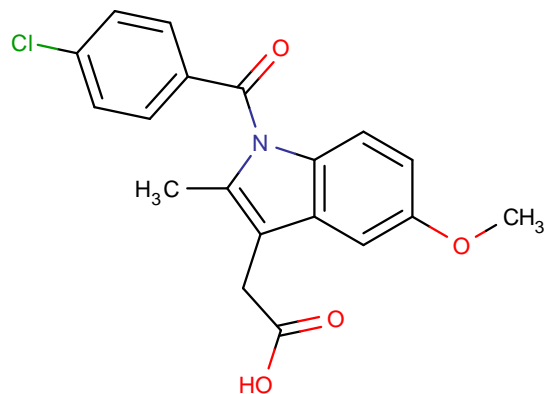
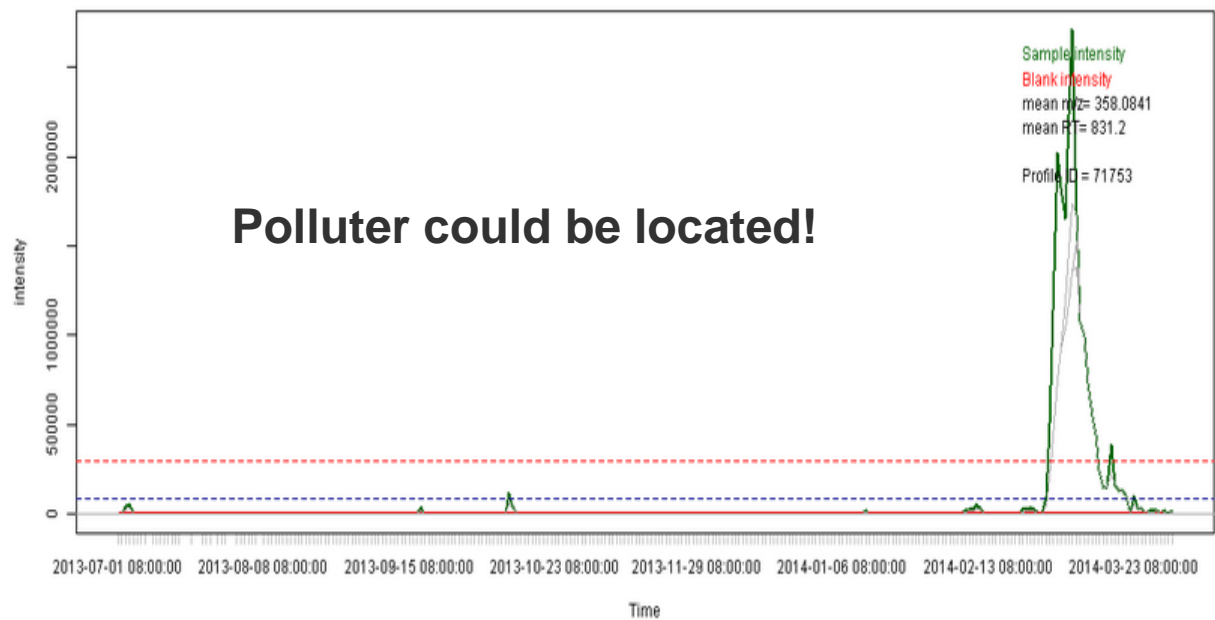
LC-HRMS



Statistical  
analysis

March 2014	1	2	3	4	5	6	7	8
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# Indomethacin spill



Concentration (max): > 0.4 µg/L  
Load (over 14 days): 170 kg

# Take home messages: Anticipating emerging contaminant risks in water

- Routine water quality monitoring programs will NOT protect human health from unlisted, non-priority emerging contaminants.
- Chemical production, use, and release information databases are insufficient for effective emerging contaminant prioritization.
- Sophisticated emerging contaminant monitoring programs are currently in use here in the US and abroad.
- Emerging contaminant surveillance in rivers will require significant investment in expertise and infrastructure.
- State, private, and academic entities can and should all work in concert to avoid another GenX situation in NC.