

# Workshop on CECs and Aquatic Ecosystem Monitoring: the state of knowledge and practice in California

May 1, 2017

## Developing a Statewide Constituent of Emerging Concern Management Strategy




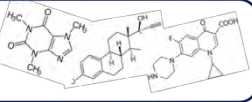
**Claire Waggoner**  
Senior Environmental Scientist  
Statewide Policies and Planning  
Division of Water Quality  
State Water Resources Control Board



# Presentation Overview



## Water Boards and the Division of Water Quality

- Framing the issue
- History and current CEC work at the Water Boards
-  CEC Initiative 
- Advancing the science to fill the gaps
  - Recycled Water Research Workshop
  - Developing CEC Screening Tools
  - Reconvening the CEC Science Advisory Panel
- Developing a statewide management strategy



# Water Boards Roles and Responsibilities

**Protect, maintain, and restore water quality**



## State Water Board

## Regional Water Boards



### Divisions

- Water Quality
- Drinking Water
- Water Rights
- Financial Assistance

### Office of Information Management and Analysis

Develop statewide water quality control plans and policies

Develop regional water quality control plans and policies

Oversee statewide water quality programs

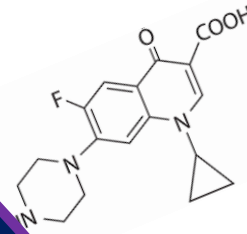
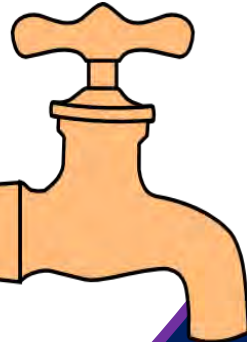
Implement statewide and regional regulations

Issue general statewide NPDES permits and waste discharge requirements

Issue and enforce NPDES permits, including monitoring



# Division of Water Quality



**Recycled Water**

**Storm Water**

**Irrigated Lands  
Regulatory  
Program**

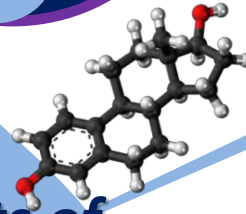
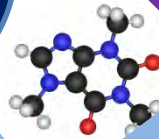
**Land  
Disposal**

**Constituents of  
Emerging  
Concern**

**Oil Field  
Produced  
Water**

**Underground  
Storage  
Tanks**

**Non-point  
Source**



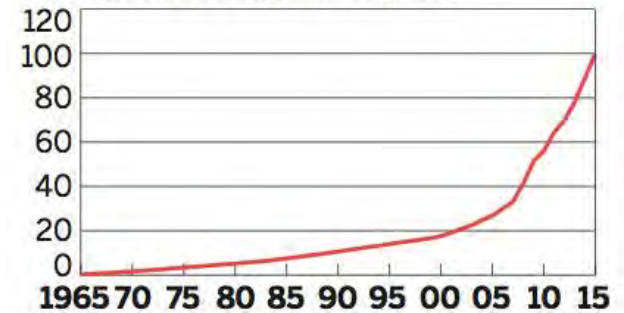
# Challenges with CECs

- Number of CECs
  - Transformation byproducts
  - Diverse chemical properties
- Analytically challenging
- Mixtures
- Data gaps (e.g., toxicity, pharmacokinetics, metabolomics)
- Disagreement on definitions

Chemical & Engineering News 2015 93(32), p14

**EXPONENTIAL GROWTH** In the past 10 years, CAS has added 75 million entries to its registry—triple the number added during the first 40 years.

Cumulative substances, millions



SOURCE: CAS



# How do we begin to address these challenges?



- Applying the standard permitting paradigm for CECs is not feasible or advisable
- Flint, Hinkley, etc. demonstrate need for action, accountability, and transparency
- Sharing the information without having all of the answers
- Messaging and strategy become critically important



# CEC History at the Water Boards

Convened  
**Expert Panels:**  
Recycled Water and Aquatic Ecosystems

Convened  
**Expert Panel:**  
Bioanalytical Tools for Monitoring CECs in Recycled Water

Recycled Water Policy adopted: **CEC monitoring requirements**, groundwater recharge

Pilot study implementation

2009

2010

2011

2012

2013

2014

2015

2016

**Final Report:**  
Monitoring Guidance for CECs in Recycled Water

**Final Report:**  
Monitoring Guidance for CECs in Aquatic Ecosystems

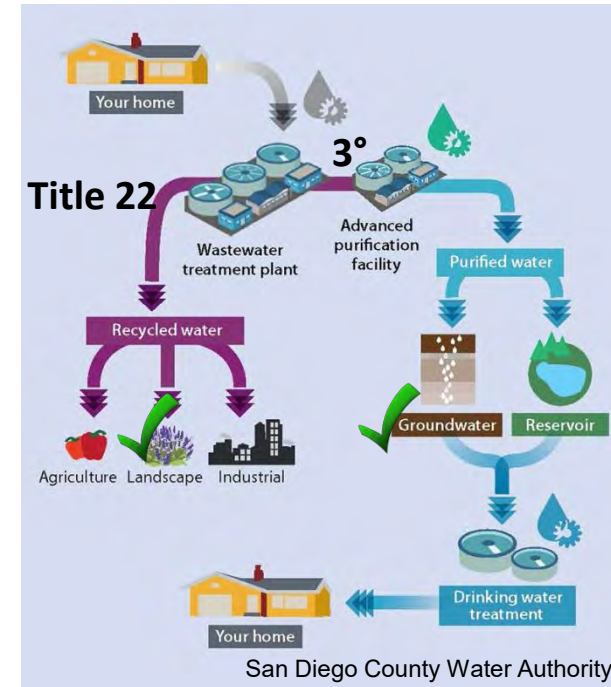
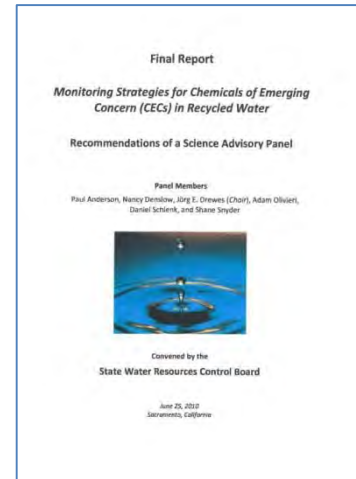
**Final Report:**  
Bioanalytical Tools for Monitoring CECs in Recycled Water

Board directed staff to update Recycled Water Policy, including CEC list



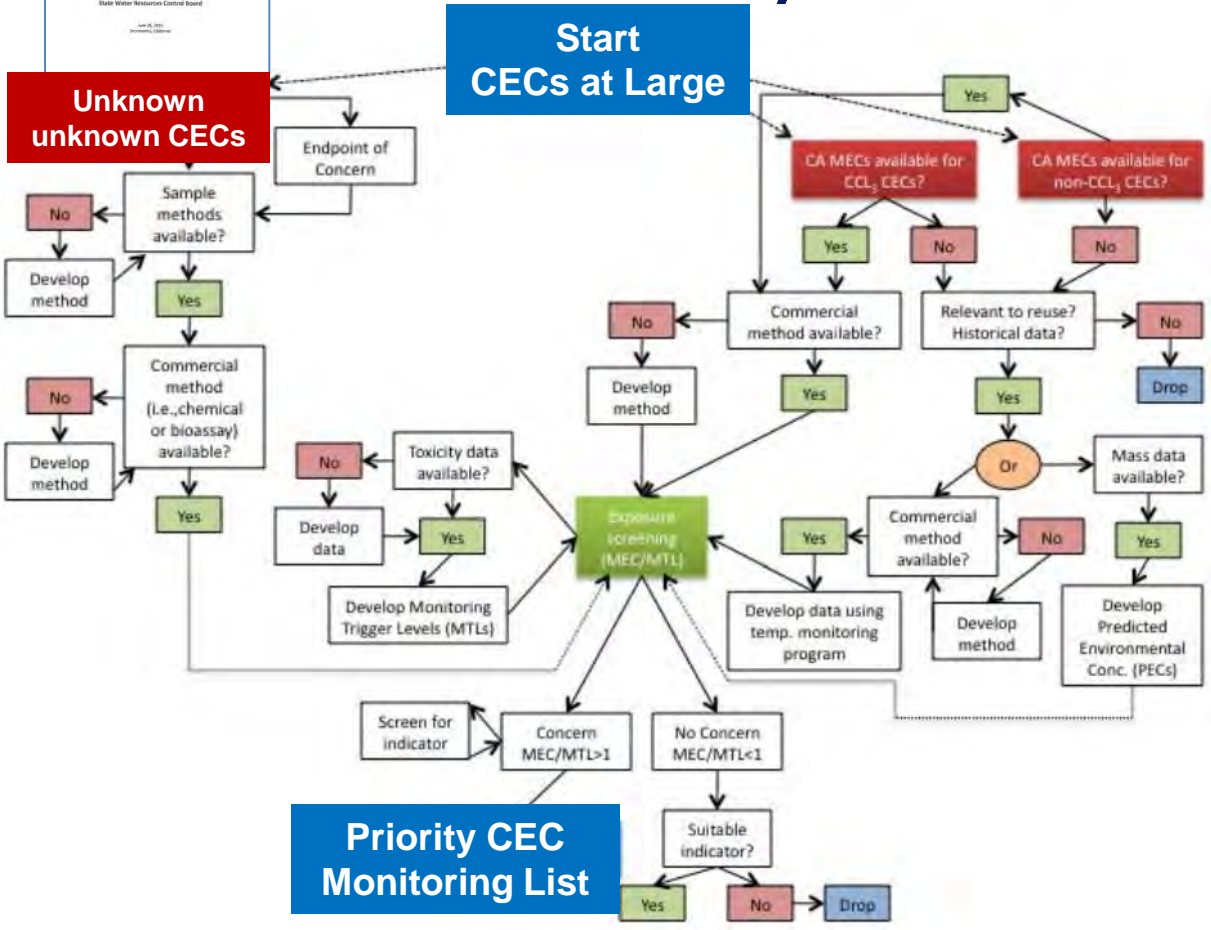
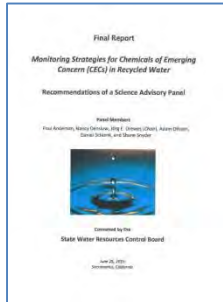
# CEC Advisory Panel for Recycled Water

- Developed a conceptual framework for determining which CECs to monitor
  - landscape irrigation
  - groundwater recharge
- Proposed using surrogates and indicator compounds to assess treatment performance





# CEC Advisory Panel for Recycled Water



- Risk-based approach
- Are there monitoring methods?
- Is it present at a concentration of concern?

Figure 8.1. Conceptual CEC prioritization scheme.



# CEC Monitoring Recommendations for Groundwater Recharge and Landscape Irrigation

Table 1 – CECs to be Monitored

Table 2: Surrogates

<u>Constituent</u>	<u>Constituent Group</u>	<u>Relevance/Indicator Type</u>	<u>Reporting Limit (µg/L)</u>
<b>GROUNDWATER RECHARGE REUSE - SURFACE APPLICATION</b>			
17β-estradiol	Steroid hormones	Health	0.001
Caffeine	Stimulant	Health & Performance	0.05
N-Nitrosodimethylamine (NDMA)	Disinfection byproduct	Health	0.002
Triclosan	Antimicrobial	Health	0.05
Gemfibrozil	Pharmaceutical	Performance	0.01
Iopromide	Pharmaceutical	Performance	0.05
N,N-Diethyl-meta-toluamide (DEET)	Personal care product	Performance	0.05
Sucralose	Food additive	Performance	0.1
<b>GROUNDWATER RECHARGE REUSE - SUBSURFACE APPLICATION</b>			
17β-estradiol	Steroid hormones	Health	0.001
Caffeine	Stimulant	Health & Performance	0.05
NDMA	Disinfection byproduct	Health & Performance	0.002
Triclosan	Antimicrobial	Health	0.05
DEET	Personal care product	Performance	0.05
Sucralose	Food additive	Performance	0.1

µg/L – Micrograms per liter


<b>GROUNDWATER RECHARGE REUSE - SURFACE APPLICATION</b>
Ammonia
Total Organic Carbon (TOC)
Nitrate
Ultraviolet (UV) Light Absorption
<b>GROUNDWATER RECHARGE REUSE - SUBSURFACE APPLICATION</b>
Electrical Conductivity
TOC

Final Report

*Monitoring Strategies for Chemicals of Emerging Concern (CECs) in Recycled Water*

Recommendations of a Science Advisory Panel

Panel Members  
Paul Anderson, Nancy Denslow, Jörg E. Drewes (Chair), Adam Olivieri, Daniel Schlenk, and Shane Snyder



Convened by the  
State Water Resources Control Board

June 25, 2010  
Sacramento, California

# CEC History at the Water Boards

Convened  
**Expert Panels:**  
Recycled Water and Aquatic Ecosystems



Convened  
**Expert Panel:**  
Bioanalytical Tools for Monitoring CECs in Recycled Water

Amended Recycled Water Policy:  
**CEC monitoring requirements**

2009

2010

2011

2012

2013

2014

2015

2016

**Final Report:**  
Monitoring Guidance for CECs in Recycled Water



**Final Report:**  
Bioanalytical Tools for Monitoring CECs in Recycled Water



# Reconvening the CEC Science Advisory Panel for Recycled Water

Convened  
**Expert Panels:**  
Recycled Water and Aquatic Ecosystems

Convened  
**Expert Panel:**  
Bioanalytical Tools for Monitoring CECs in Recycled Water

Recycled Water Policy adopted: **CEC monitoring requirements**, groundwater recharge

Pilot study implementation

2009

2010

2011

2012

2013

2014

2015

2016

**Final Report:**  
Monitoring Guidance for CECs in Recycled Water

**Final Report:**  
Monitoring Guidance for CECs in Aquatic Ecosystems

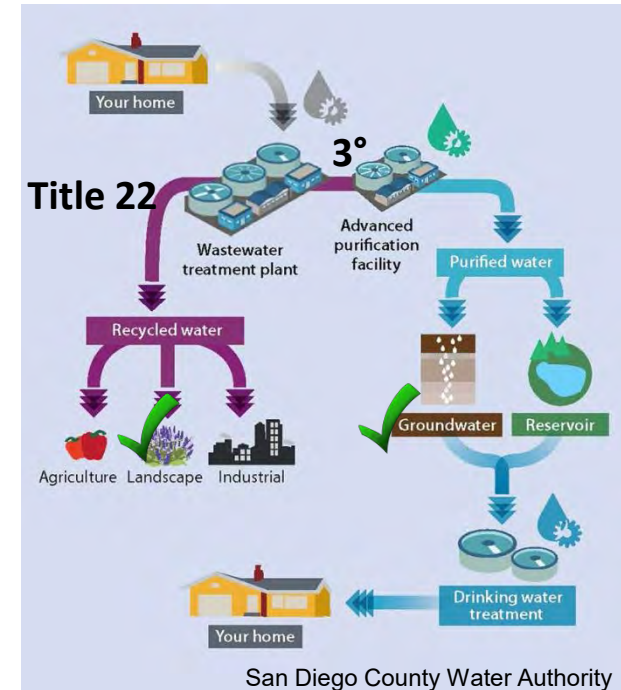
**Final Report:**  
Bioanalytical Tools for Monitoring CECs in Recycled Water

**Board directed staff to update Recycled Water Policy, including CEC list**



# Reconvening the CEC Science Advisory Panel for Recycled Water

- Re-visit groundwater recharge and landscape irrigation
- Expanded uses under Title 22
- Consider CEC monitoring for surface water augmentation
- Apply the existing framework
- Update list of CECs, surrogates, indicators and monitoring recommendations



COMING  
SOON!



# CEC Advisory Panel on Ambient Monitoring

Convened  
Expert Panel:  
Aquatic  
Ecosystems

- Develop a monitoring strategy for CECs in marine and freshwater aquatic ecosystems

Pilot study  
implementation

2009

2010

2011

2012

2013

2014

2015

2016

Final Report:  
Monitoring  
Guidance for  
CECs in  
Aquatic  
Ecosystems

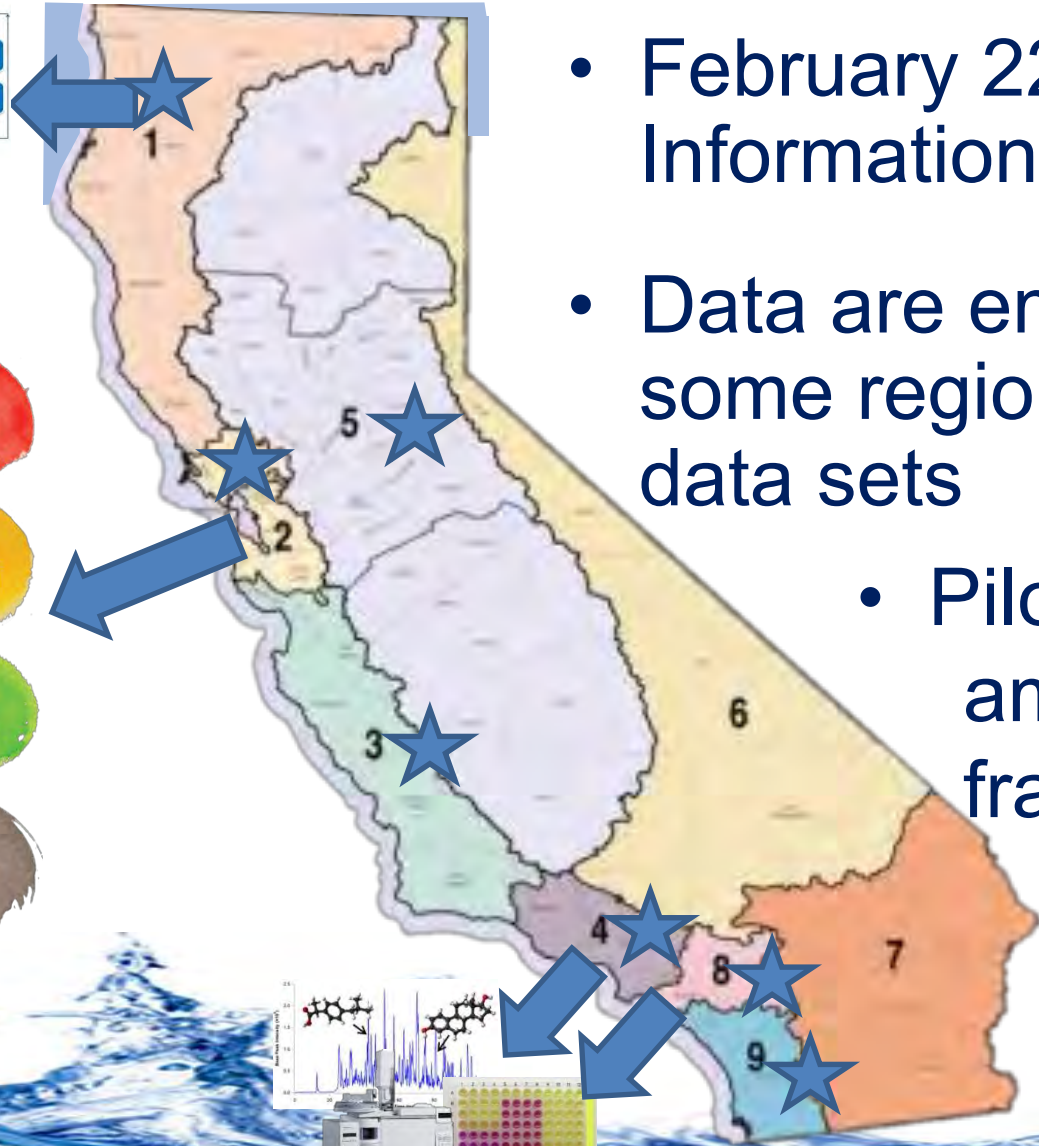
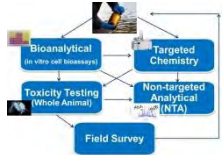
## Panel Recommendations

- Risk-based framework for selecting CECs
- Adaptive monitoring approach
- Pilot Studies

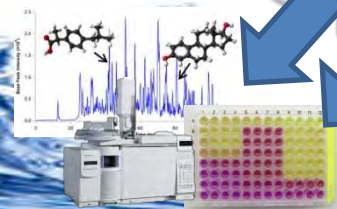




# CEC Projects at the Regional Water Boards



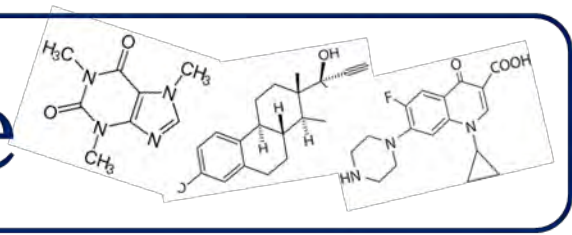
- February 22, 2017 Information Item
- Data are emerging, and some regions have robust data sets
- Pilot test the panel's ambient monitoring framework & report back



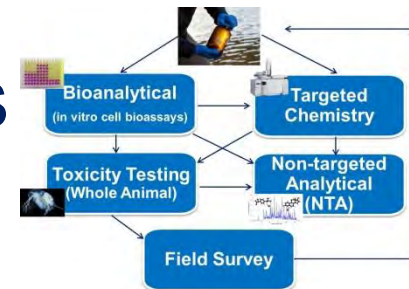




# CEC Initiative

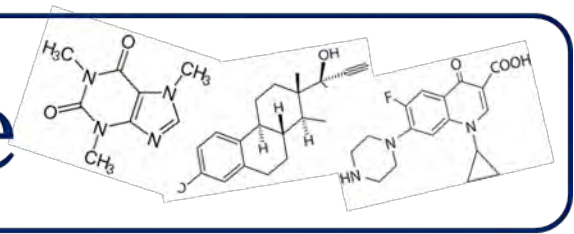


- Phase 1: Improve statewide coordination and identify existing data sets
  - Current focus is municipal wastewater treatment facilities and ambient CEC monitoring
  - Eventually include other programs
- Phase 2: Identify data gaps; what's working and not working with pilot monitoring framework; fill the gaps





# CEC Initiative



- Phase 3: Develop a regulatory framework or management strategy to address CECs statewide
  - Use a risk-based framework to narrow the universe of CECs
  - Regional input with an extensive stakeholder process



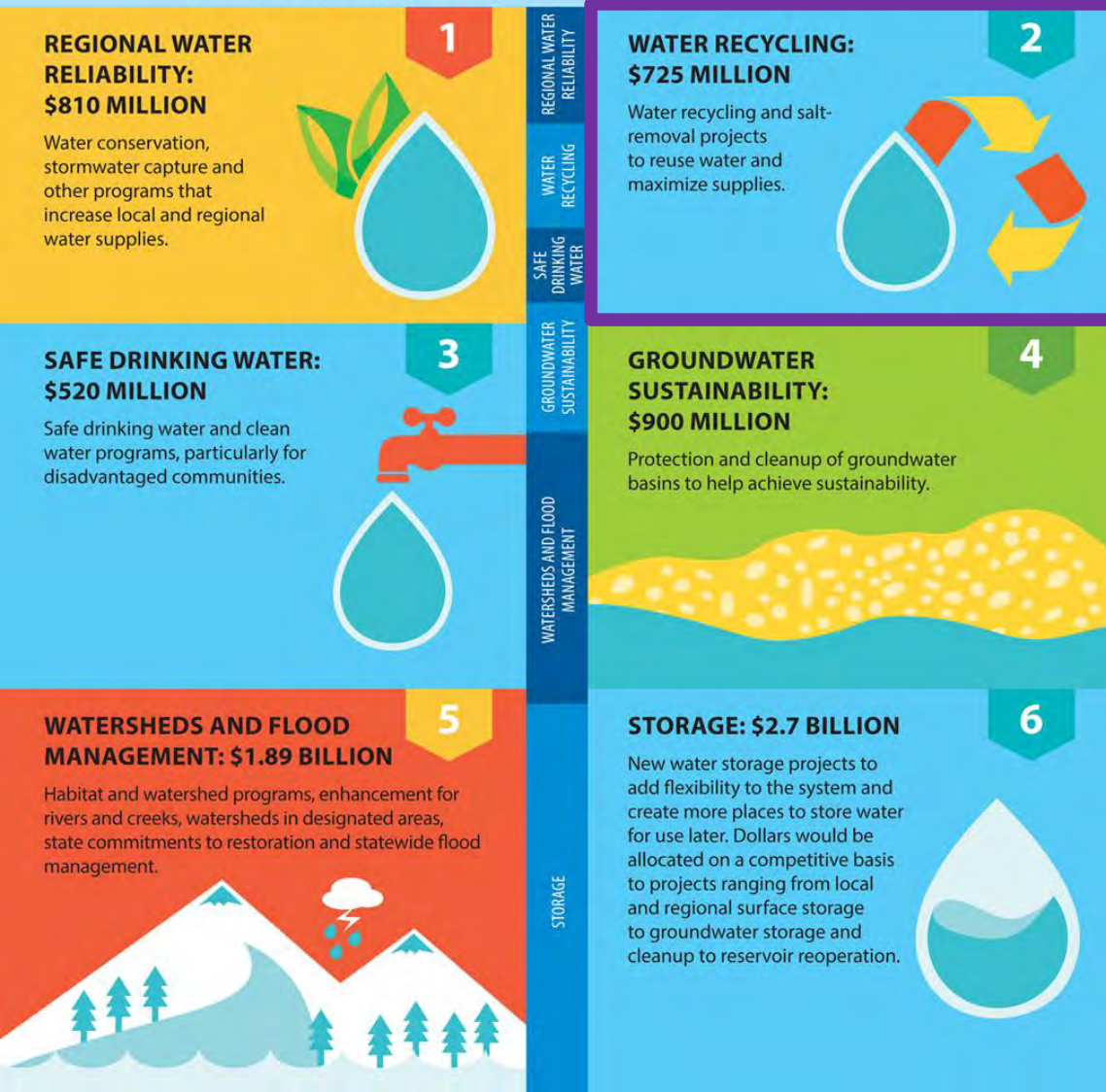
# Closing the Gaps: Identifying and Funding Research Needs

- Identify research needs by collaborating with the experts
  - e.g., CEC Initiative, SWAMP CEC focus group, outreach to the community, workshops, etc.
- Fund multi-benefit projects
  - e.g., developing SOPs for *in vitro* cell bioassays for water recycled water, stormwater, wastewater influent and effluent, drinking water, ambient, etc.



# What's In Proposition 1

Water Quality, Supply and Infrastructure Improvement Act of 2014



**\$625 million for Recycled Water Infrastructure**

**Up to 2% for recycled water research projects**

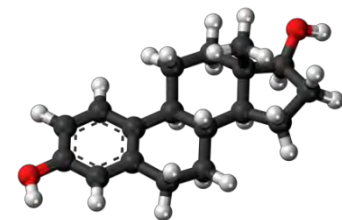
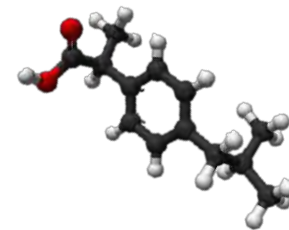
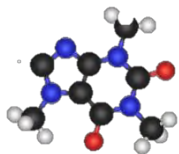
- 1% pilot projects
- **1% other research**





# Recycled Water Research Needs:

## Monitoring and Treatment Performance for CECs

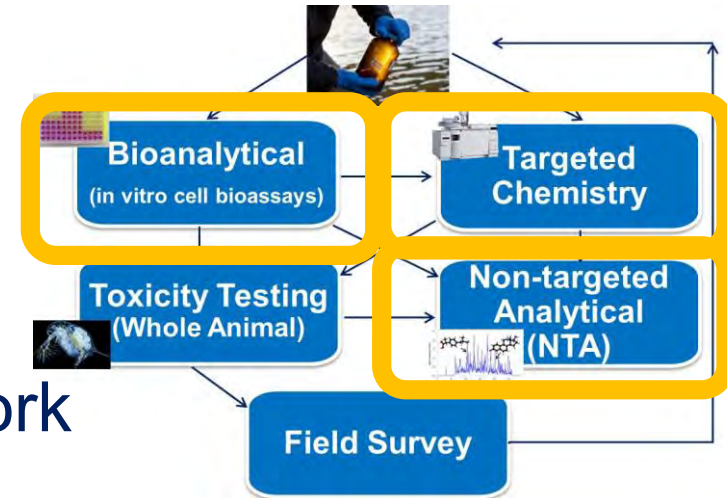


- October 2015 Workshop
- Research themes:
  - chemical testing, bioanalytical screening, and non-targeted analyses
  - performance of treatment technologies
- ***Summary document now available online***



# CEC Research Needs

- Improve screening tools
  - Develop standard methods
  - Develop an interpretive framework



- Identify CECs of greatest risk to human health and wildlife
- Improve source control
- Optimize treatment trains

**Are there monitoring methods for it?**

**Is it present at a concentration of concern?**



# Developing a Successful CEC Management Strategy

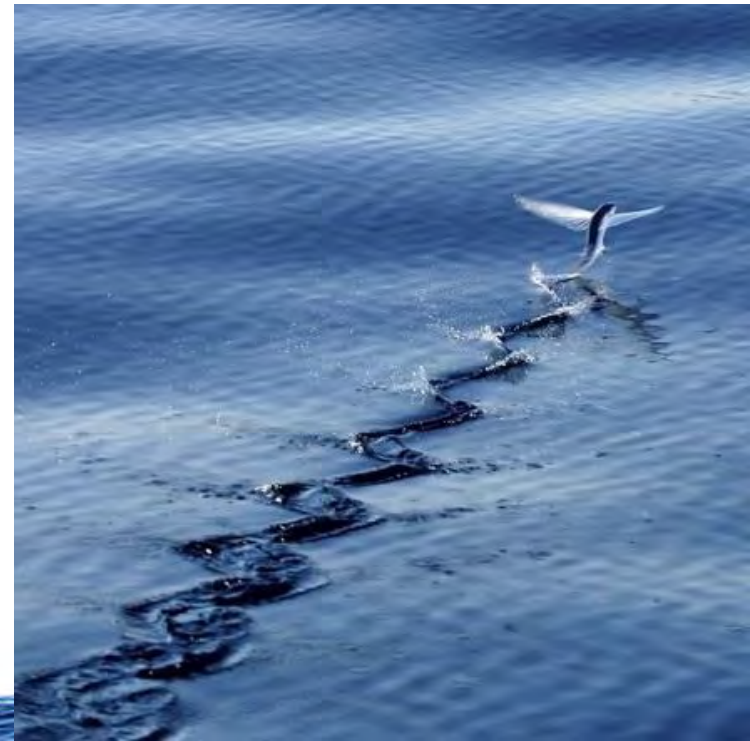
- Must be based on sound science and include an adaptive management framework
- Transparent process with public/stakeholder outreach
  - Build trust and confidence
  - Thoughtfully packaging and messaging the science
  - Clear risk communication
- Let's work together



COMING

SOON!

**July 19 and 21, 2017 in Southern California**  
**December 12, 2017 in Sacramento**  
CEC Science Advisory Panel for  
Recycled Water Meetings





# Thank You, Any Questions?



CALIFORNIA

**Water Boards**

STATE WATER RESOURCES CONTROL BOARD  
REGIONAL WATER QUALITY CONTROL BOARDS

**Claire Waggoner**

Statewide Policies and Planning  
Division of Water Quality

(916) 341-5582

[claire.waggoner@waterboards.ca.gov](mailto:claire.waggoner@waterboards.ca.gov)

