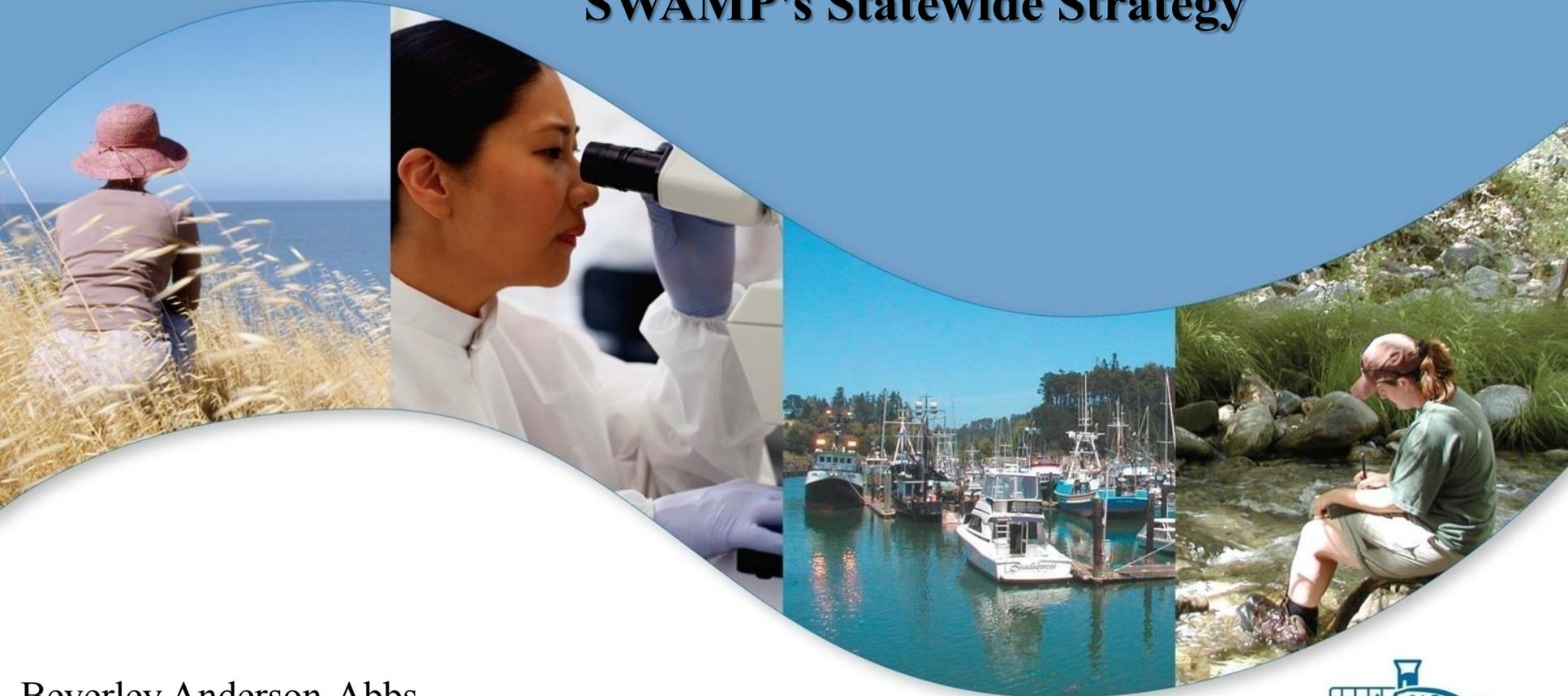


California's Surface Water Ambient Monitoring Program (SWAMP)

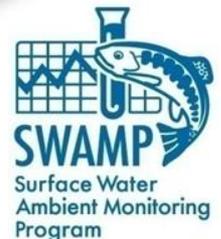
Freshwater Harmful Algal Blooms (HABs) in California and SWAMP's Statewide Strategy



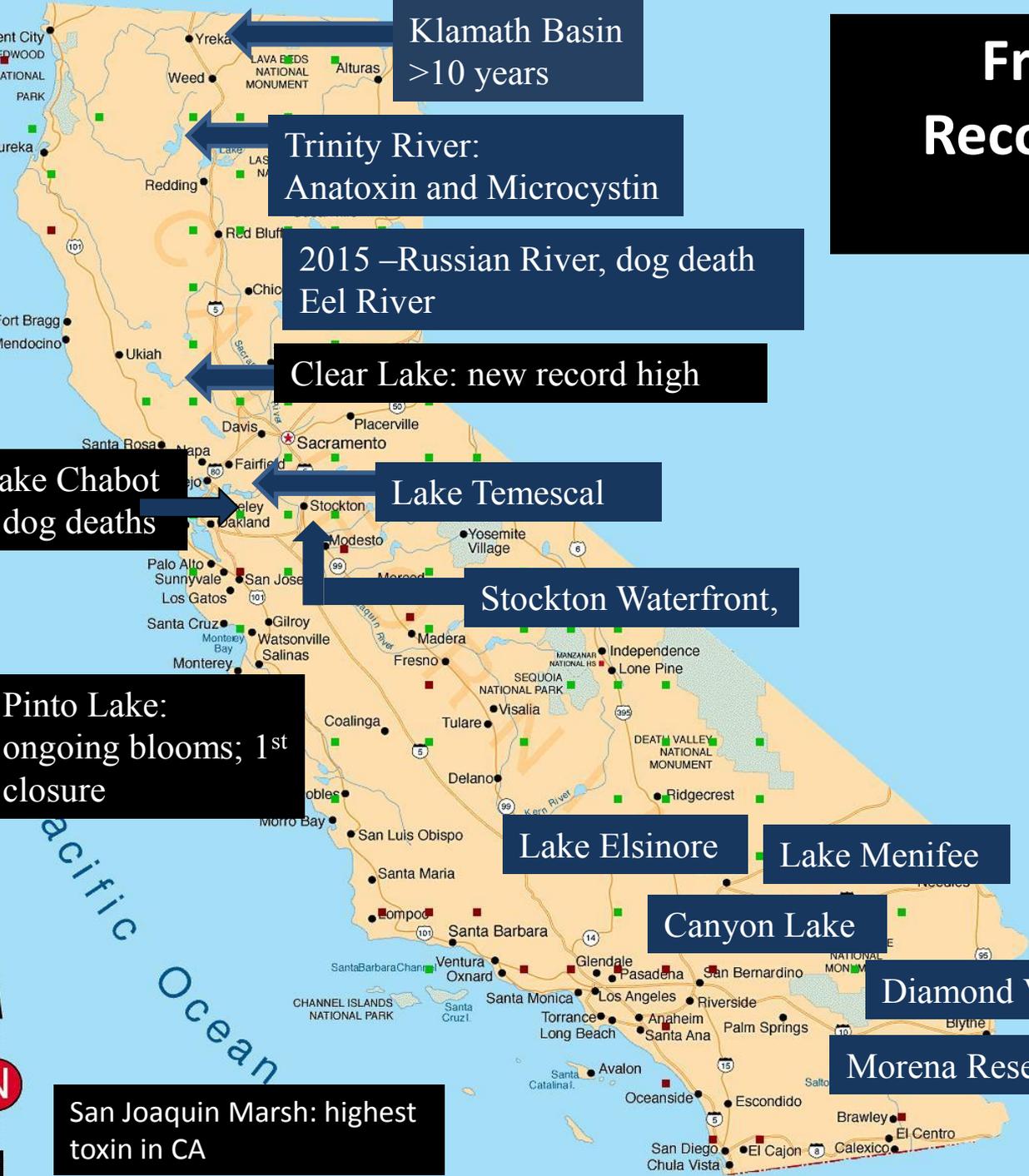
Beverley Anderson-Abbs

SWAMP – OIMA

Bev.Anderson-Abbs@waterboards.ca.gov



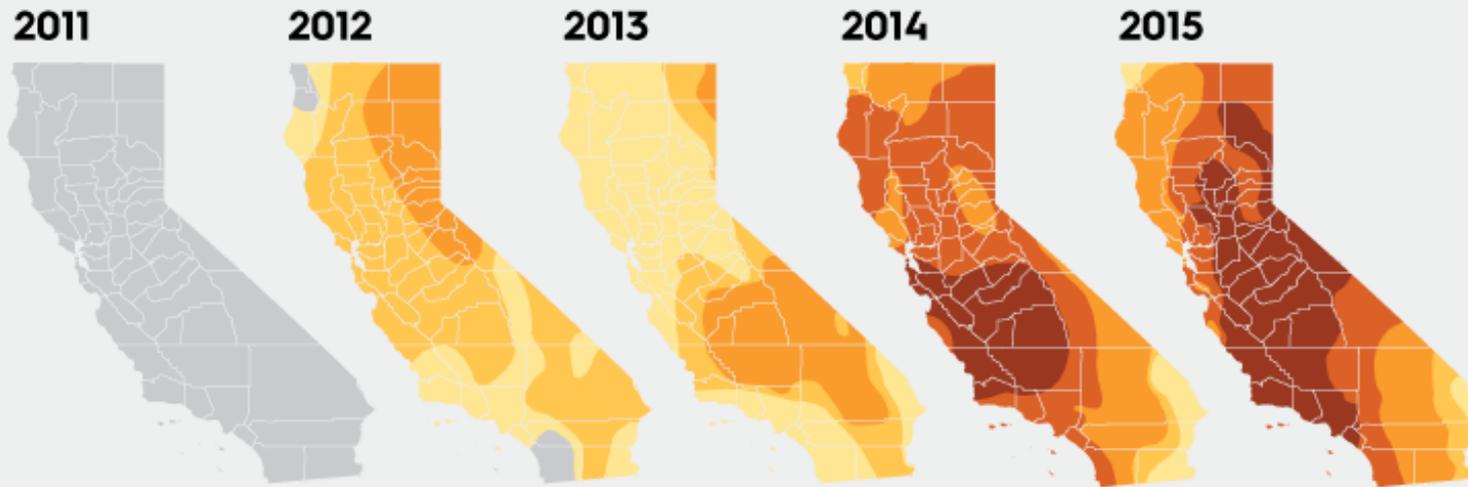
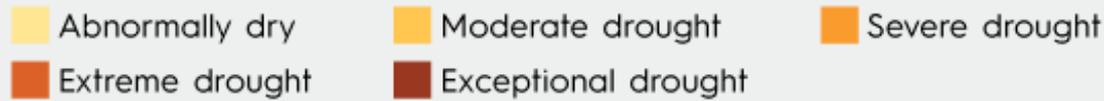
Freshwater Toxins Record Breaking Years 2014 – 2015



- First time several lakes closed due to cyanotoxins
- Extremely high toxin concentrations recorded
- Several dog deaths attributed to toxins
- Multiple toxins detected simultaneously

A Record-Breaking Drought

41% of the state is facing “exceptional drought” (the most severe kind).



VISUAL NEWS



Paerl et al. 2009

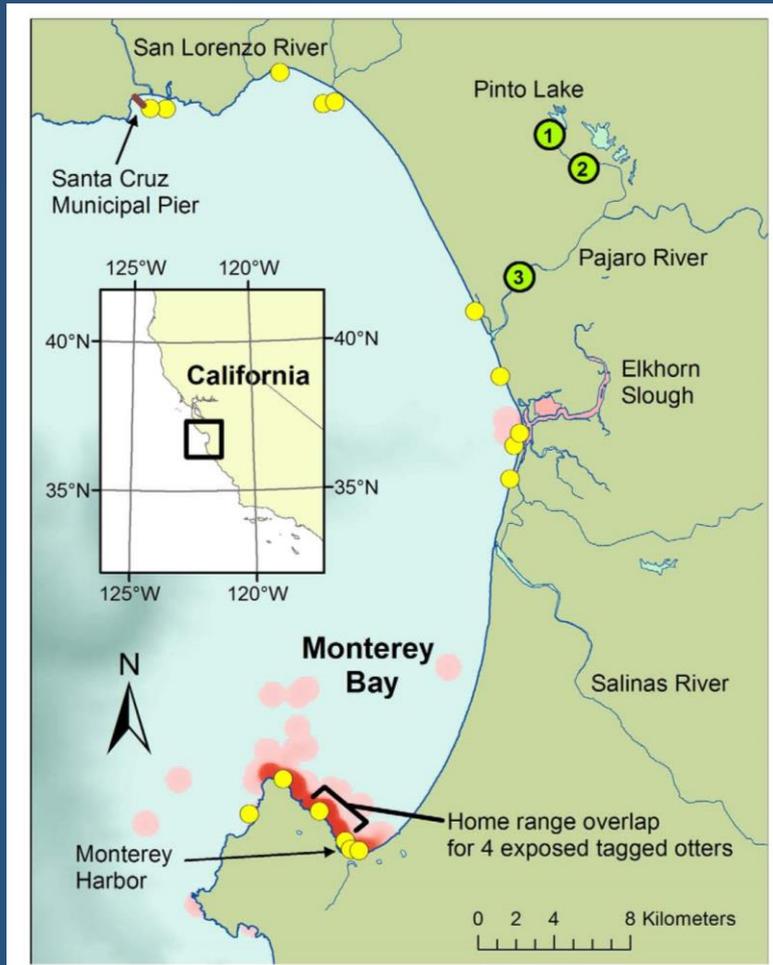
CLIMATE

Blooms Like It Hot

Hans W. Paerl¹ and Jef Huisman²

A link exists between global warming and the worldwide proliferation of harmful cyanobacterial blooms.

Far-Reaching Effects of Freshwater Toxins to Marine Waters



Mortality of sea otters due to microcystin intoxication

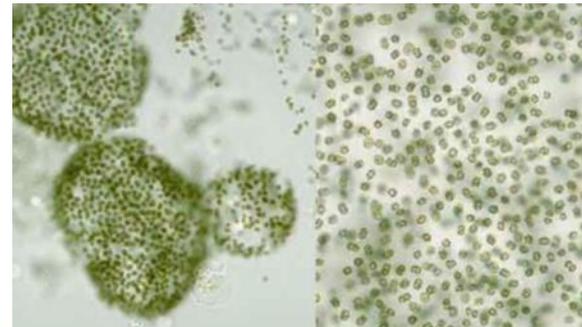


Miller et al., 2010

Microcystins are persistent in the major watersheds that flow into the ocean in Monterey Bay (Gibble and Kudela, 2014)

SWAMP Freshwater HABs Program

- Statewide workshop on Cyanotoxins in 2012
- Multiple trainings hosted in 2015 and 2016
- Remote sensing analysis to detect blooms and identify cyanobacteria blooms
- Regional cyanotoxin studies throughout California
- Initiate a statewide freshwater HABs assessment and support strategy



Statewide Freshwater HABs Strategy

Goal: Develop and communicate a coordinated and widely supported long-term vision to mitigate freshwater HABs

Freshwater HAB Monitoring and Assessment Framework

Response to HAB Event

Field Assessment and Monitoring

Risk Assessment

Immediate Event
Response

Long Term Response

Response to HAB Events

Freshwater HAB Monitoring and Assessment Framework

Response to HAB Event

Field Assessment
and Monitoring

Risk Assessment

Immediate Event
Response

Long Term Response

- Decision Tree
- SOPs for sampling & analysis
- QAQC
- Health and Safety

- Infrastructure development
 - portal
 - guidance documents
 - training
 - outreach
- Identify environmental stressors



Field Assessments and Monitoring

Freshwater HAB Monitoring and Assessment Framework

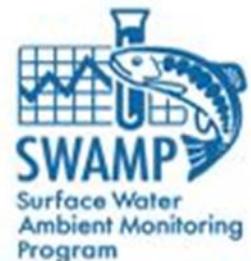


Field Assessment and Monitoring

Risk Assessment

- Status and Trends report
- Add to existing monitoring programs
- Local Monitoring Programs
- Add to existing condition assessments

Limits - streams vs river
-ephemeral nature of HABs

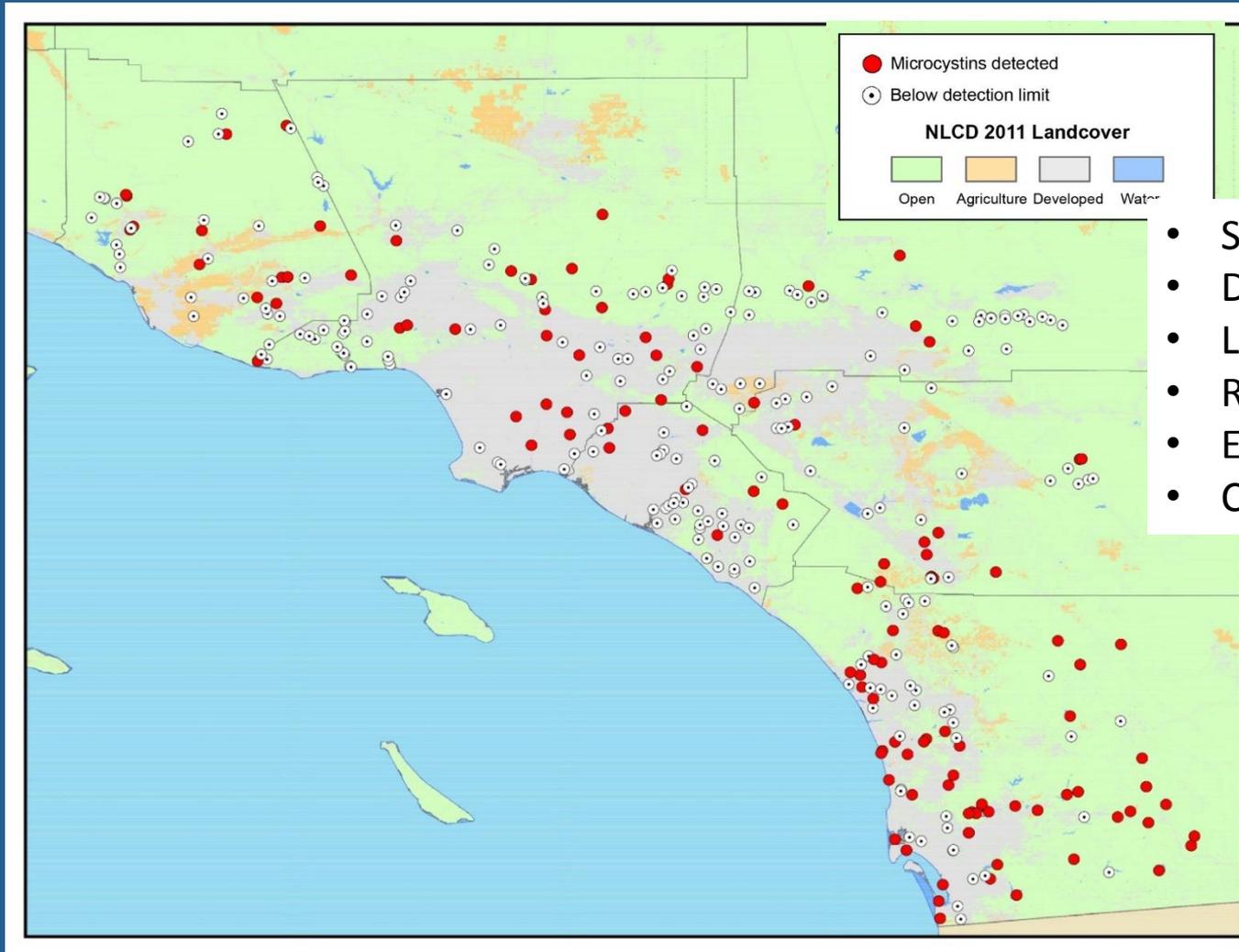


Southern CA Assessments for Cyanotoxins

- Regional Assessments
 - Wadeable streams
 - Depressional wetlands
- Targeted Assessments
 - Lakes and reservoirs
 - Estuaries and coastal lagoons



Toxin Production Widespread Across Multiple Waterbody Types



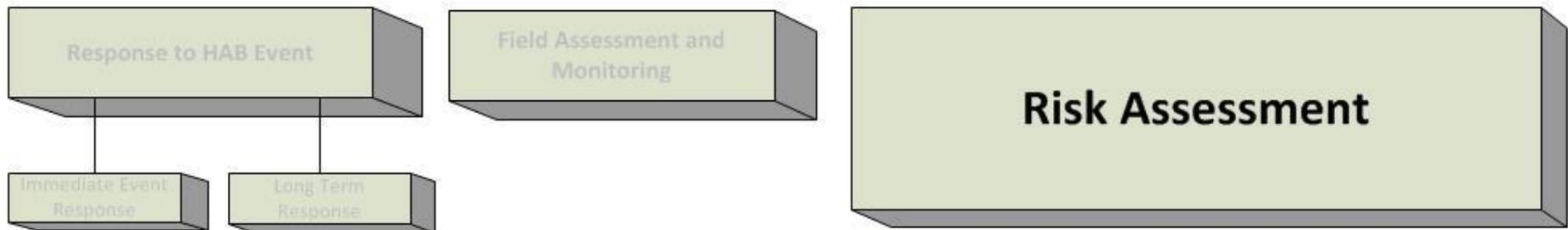
- Streams
- Depressional Wetlands
- Lakes
- Reservoirs
- Estuaries
- Coastal lagoons

Many loading sources of toxin to coastal waters in S. CA

Risk Assessment for HABs

- Determine the target regions, watersheds or waterbodies at risk for recurring HAB issues

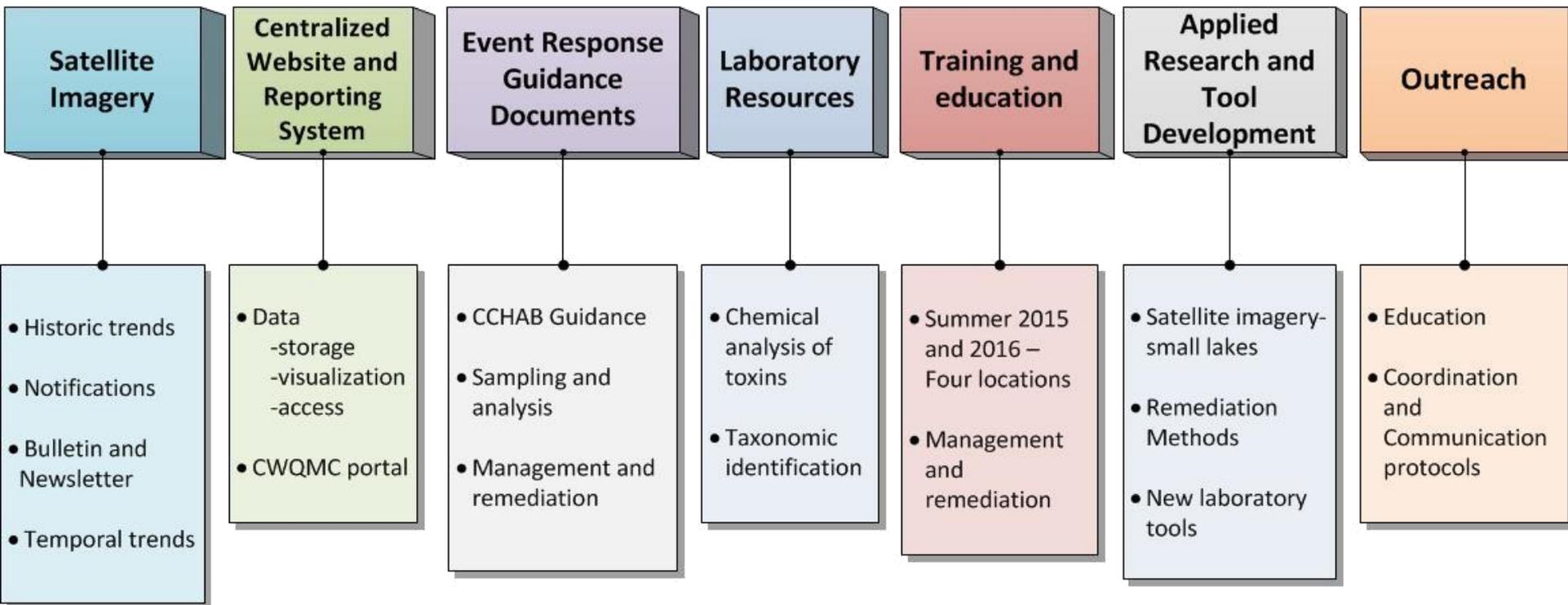
Freshwater HAB Monitoring and Assessment Framework



Historical analysis of blooms
Landscape risk analysis

Infrastructure to Support the Strategy

Infrastructure



Next Steps

- Determine the roles of state, county and local agencies in HAB mitigation and management
 - HABs and associated toxins relate directly to the missions of a wide range of agencies in CA
 - Agency coordination to efficiently use resources directed at HAB monitoring and mitigation
- Identify long-term resources and funding mechanisms to maintain program
 - SWAMP Freshwater HABs Program has provided funding for many aspect of infrastructure development
 - Other states use several approaches to maintain programs:
 - Consistent funding through legislature
 - Designated funds through state, county or local agencies
 - State mandated fee based funding
 - Leveraged resources from other monitoring or volunteer citizen scientist programs
 - Grants from federal or state funding programs

