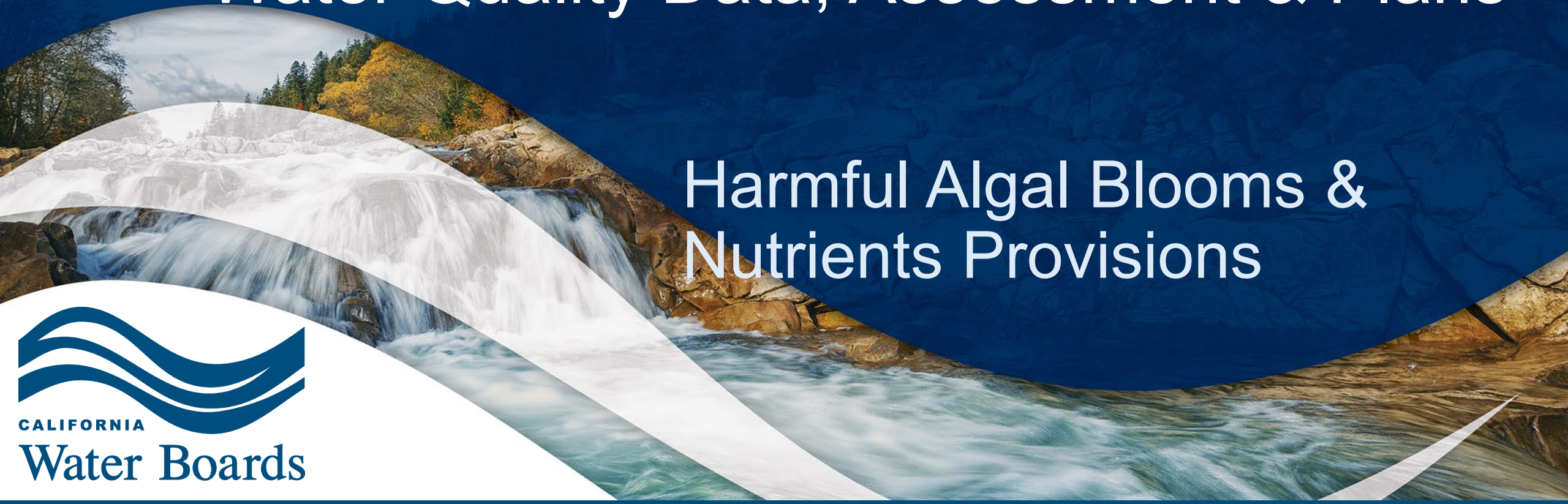
Division of Water Quality

2025 National Training Workshop on Water Quality Data, Assessment & Plans



Harmful Algal Blooms & Nutrients Provisions

CALIFORNIA Water Boards

June 5, 2025

Outline

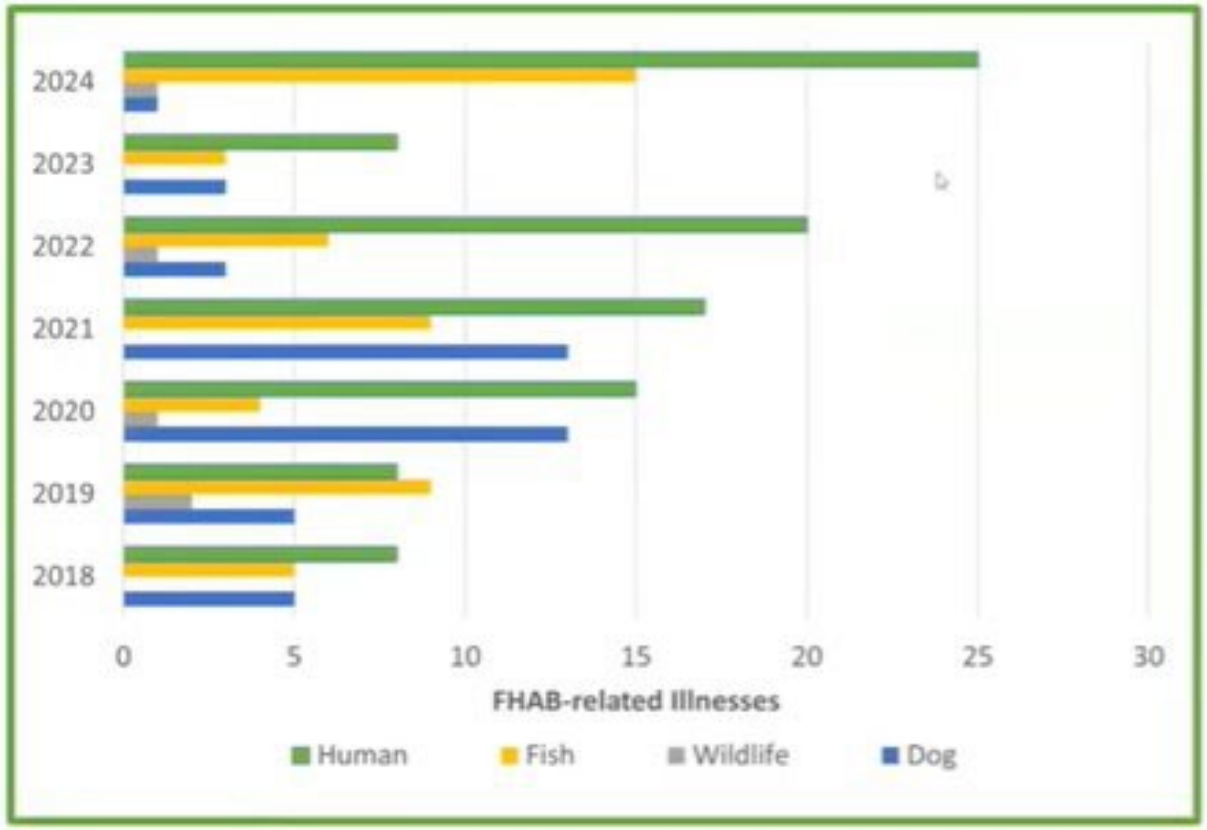
- The Scope of the Problem in California
- The Proposed HABs and Nutrients Provisions
- Beneficial Uses we are protecting.
- Current Water Quality Objectives
- Our proposed HABs & Nutrients Provisions
- Cyanotoxin parameters
- Biostimulatory parameters
- What we are seeing in TMDLs
- TMDL highlights

The Scope of the Problem and the need for the Provisions - Hazardous Algal Blooms (HAB)s

- HAB-related incidents are steadily increasing in CA
- The problem is widespread throughout CA
- Incidents are most prevalent in the Summer months but may occur throughout the year
- Several dog deaths linked to cyanotoxins
- Illnesses in humans include:
  - Skin irritation
  - Liver & kidney damage
  - Neurological damage
  - Gastrointestinal distress

2018-2024 HAB-related case reports by Category

Reported to CDC's One Health HAB System (OHHABS)

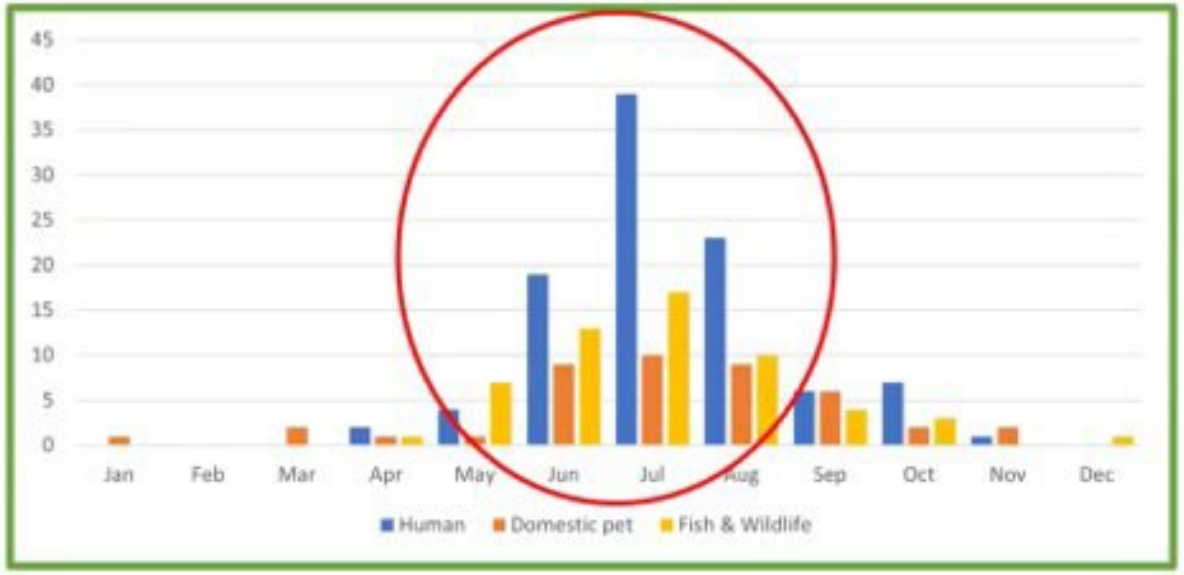


Freshwater illnesses reported as HAB-related to OHHABS from 2018 – 2024. Number represents individuals, except when submitted as a group, such as for fish or wildlife illness events.

From 2018-2024, 200 cases met the Centers for Disease Control and Prevention (CDC) case definition criteria for a HAB-associated illness.

HAB events that cause illness occur across California and throughout the year

Reported to CDC's One Health HAB System (OHHABS) 2018 – 2024



Reported human and animal HAB-related illnesses by exposure month (2018-2024).

Reported human and animal HAB-related illnesses by county (2018-2024). Nearly 40 California counties have reported HAB-related illnesses.

The Scope of the Problem and the need for the Provisions - Biostimulation

- Major concern in aquatic ecosystems
- Accelerated accumulation of organic matter
- Restructuring algal & plant communities
- Changes in benthic communities
- Fluctuations in pH and DO
- Fish kills and lower fish production

The Scope of the Problem and the need for the Provisions – HABs & Biostimulation

- Causes:
  - Discharge of Nitrogen & Phosphorus
  - Accumulation in Sediments
  - Physical Changes to Waterbodies
  - Increase in Temperature

Beneficial Uses for HABs

- Municipal Drinking Water (MUN)
- Water Contact Recreation (REC-1)

Other Beneficial Uses (Possible Future)

- Tribal Tradition & Culture (CUL)
- Dogs & Other Domestic Animals
- Non-Water Contact Recreation (REC-2)
- Subsistence Fishing (SUB) & Tribal Subsistence Fishing (T-SUB)
- Commercial & Sports Fishing (COMM)
- Wildlife Habitat (WILD)
- Aquatic Life Beneficial Uses (WARM)(COLD)(EST)(MIGR)(SPWN)(RARE)
- Shellfish Consumption (SHEL)





Biostimulation Beneficial Uses

AQUATIC LIFE

- Warm Freshwater Habitat (WARM)
- Cold Freshwater Habitat (COLD)
- Wildlife Habitat (WILD)
- Estuarine Habitat (EST)
- Preservation of Rare, Threatened, or Endangered Species (RARE)
- Migration of Aquatic Organisms (MIGR)Spawning, Reproduction, or Early Development (SPWN)

RECREATION

- Water Contact Recreation (REC-1)
- Non-contact Water Recreation (REC-2)

DRINKING WATER

- Municipal and Domestic Supply (MUN)

Other Beneficial Uses

- Tribal Tradition and Culture (CUL) / Native American Culture (CUL)
- Tribal Subsistence Fishing (T-SUB)
- Subsistence Fishing (SUB)
- Commercial and Sport Fishing (COMM)
- Aquaculture (AQUA)
- Shellfish Harvesting (SHEL)
- Navigation (NAV)
- Agricultural Supply (AGR)
- Dogs & domestic animals

Current Use of Narrative Objectives

- Region 1 Example

Waters shall not contain biostimulatory substances in concentrations that promote aquatic growths to the extent that such growths cause nuisance or adversely affect beneficial uses

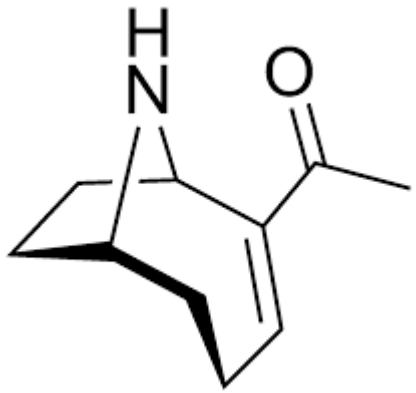
The Harmful Algal Blooms & Nutrient Provisions

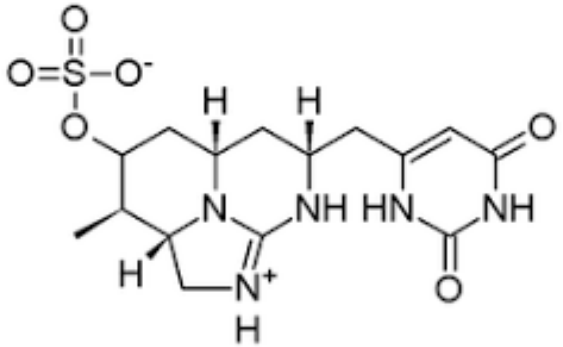
We intend to include the following item in the Provisions

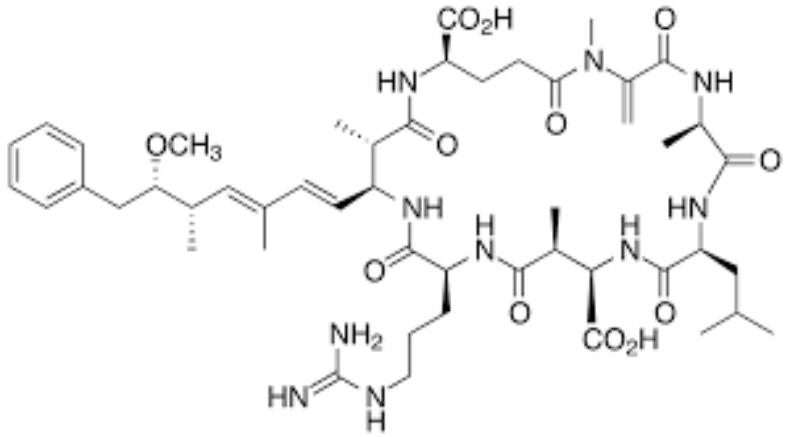
- Numeric Water Quality Objectives for Cyanotoxins (for all waters)
- Numeric Water Quality Objectives for Biostimulatory Parameters (for wadeable streams)
- Formalize & Expand use of Biological Conditions Assessment Methods & Scoring Tools
- Establish a Program of Implementation to:
  - Achieve the Cyanotoxin & Biostimulatory Objectives
  - Reduce the Incidents of HABs
  - Improve Biological Conditions

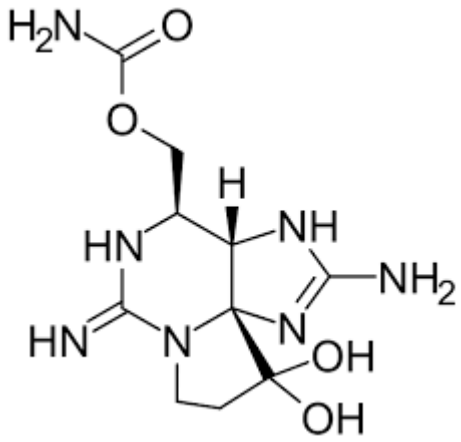
The Cyanotoxins

- Microcystins
- Anatoxin-a
- Cylindrospermopsin
- Saxitoxin









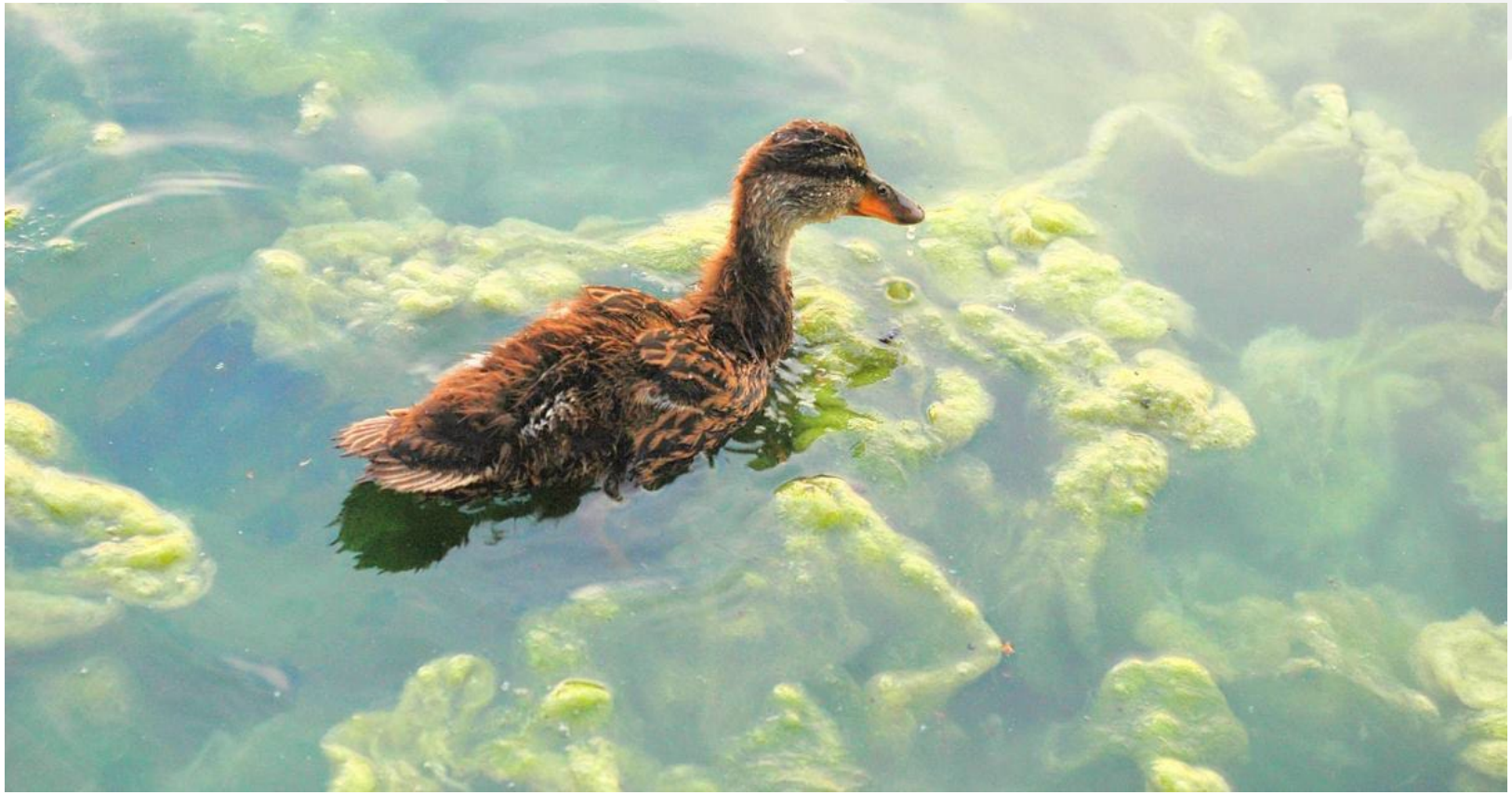
Microcystins: REC-1 Thresholds

Exposure Route	Exp. Duration	Health Impact	Concentration µg/L	Study	Agency and Type
Ingestion/dermal	**Acute (child)**	**Moderate liver pathology**	**0.8**	**Heinze 1999**	**OEHHA (2016)** Caution Trigger Level
Ingestion/dermal	Acute (child)	Moderate to severe liver pathology	6.0	Heinze 1999	OEHHA Warning Trigger Level
Ingestion/dermal	Acute (child)	rashes and gastrointestinal symptoms	24.0	WHO 1999	WHO Guideline Reference Value
Ingestion/dermal	Acute	liver toxicity	8.0	U.S. EPA, 2019	U.S. EPA 304(a) HH Criteria

Biostimulatory Perameters

- Total Nitrogen & Total Phosphorus
- Chlorophyl-a
- Ash Free Dry Mass
- Percent Algal Cover

What are regions requiring in their TMDLs to try to achieve reductions in cyanotoxins and/or nutrients?



Parameters used in TMDLs, permits, Integrated Report

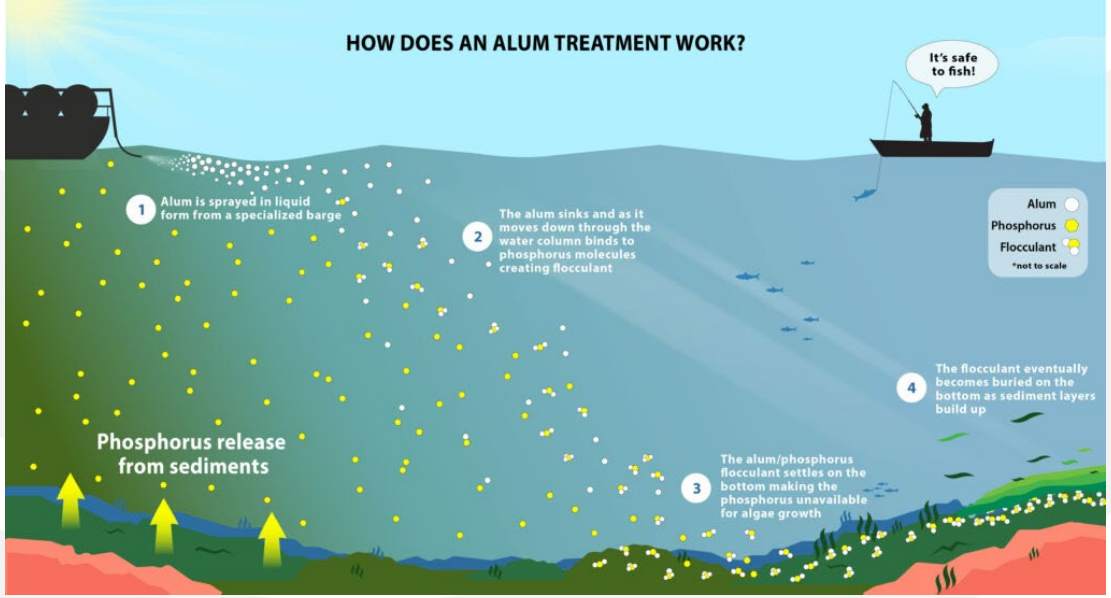
- Only 6 TMDLs are for cyanotoxins (microcystins)
- Most are for DO & pH
- Other parameters include:
  - Chl-a
  - Benthic algal biomass
  - Nitrate and/or nitrite
  - Ortho phosphorus
  - Macroalgal cover
  - Ammonia

Numeric Evaluation Guidelines Exceedances

Analyte	Numeric Evaluation Guideline	Number & Percent of Exceedances	Threshold Type
California Stream Condition Index	0.79	4/11 (36%)	Biological Condition
Macroalgae cover (%)	30%	2/12 (17%)	Eutrophication
Benthic algae biomass	40 g/m^2	5/12 (42%)	Eutrophication
Benthic algae chlorophyll *a*	100 mg/m^2	0/12 (0%)	Eutrophication
Total phosphorous	0.166 mg/L	4/17 (24%)	Eutrophication
Total nitrogen	0.59 mg/L	5/13 (38%)	Eutrophication
Daily dissolved oxygen change	< 5 mg/L	6/363 (2%)	Eutrophication
Dissolved oxygen- 7-day average of min values	7.0 mg/L	69/332 (21%)	Eutrophication
Total ammonia	0.6-3.3 mg/L	0/12 (0%)	Toxicity
Nitrate + Nitrite as N	10 mg/L	0/17 (0%)	Toxicity
Nitrite as N	1 mg/L	0/11 (0%)	Toxicity

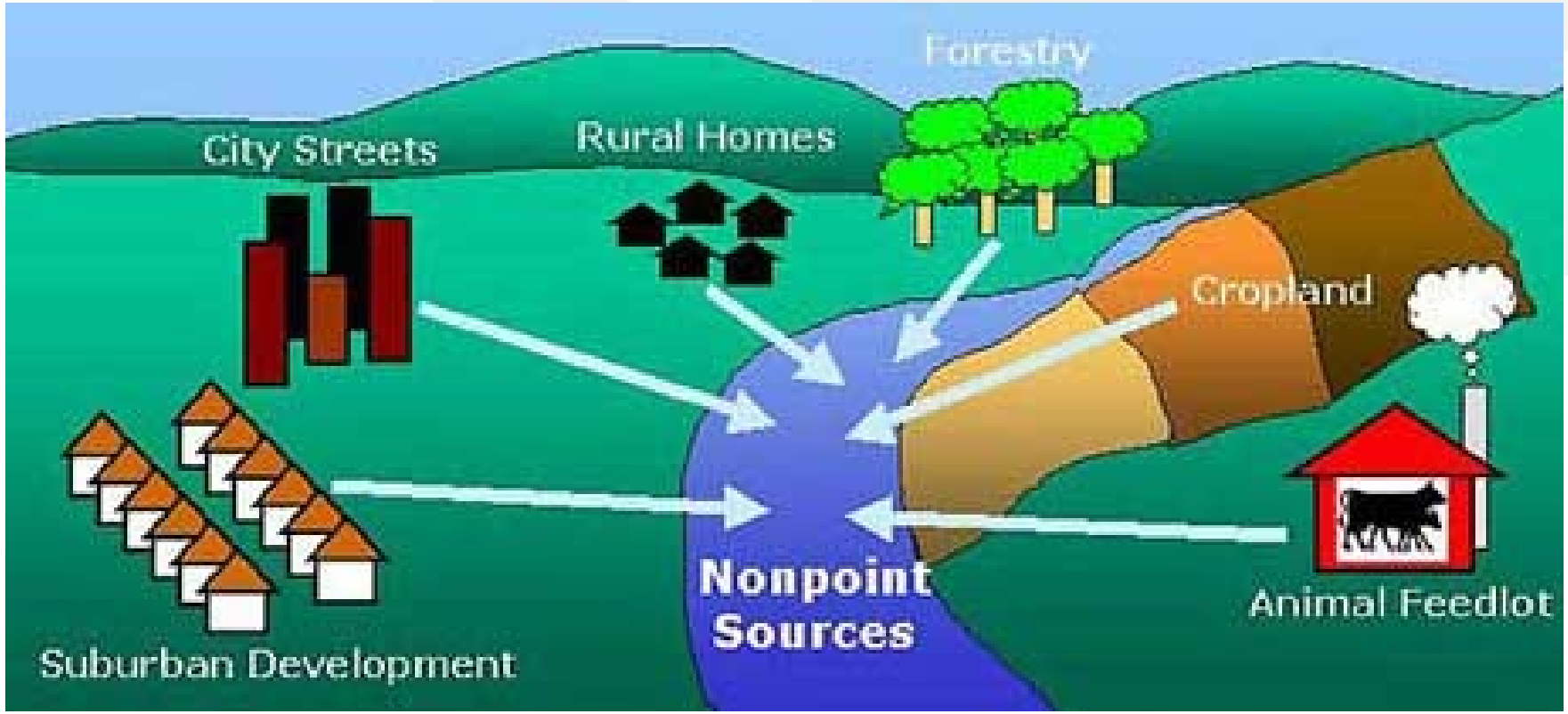
Mitigation Strategies

- Alum Treatments
- Aeration Systems
- Algicides
- Bioreactors
- Sediment Control Practices
  - (rolling dips, sediment control basin, grassed waterway)



- Discharge Controls
- Monitoring
- Nutrient Management Plans
- Irrigation Management

Highlight TMDLs



Pinto Lake

	HABs in Pinto Lake (2018) **Region 3**
BU affected	REC-1, REC-2, AGR, MUN, WILD, WARM, SPWN, COMM
Source	Ag, urban, industrial facility runoff, cropland, grazing land, onsite wastewater treatment systems, woodlands, shallow ground water
Implementation	Sediment control practices (rolling dips, sediment control basin, grassed waterway) to address nutrient rich run-off. Nonpoint Source Implementation Grant Alum Treatment
Monitoring	City of Watsonville Stormwater program is required to conduct weekly microcystin sampling in the lake.
Results Reported	Conditions Improving
Outcomes	Post alum treatment results show dramatic decreases in in-lake phosphorus loadings, as well as a significant decrease in the duration and severity of the fall microcystin toxicity (2018 report, now it is wearing off).

Famosa Slough

	Nutrients in Famosa Slough (2022) Region 9
BU affected	COMM, EST, MAR, MIGR, RARE, REC-1, REC-2, WILD, SHELL, SPWN
Source	Urban Stormwater runoff
Implementation	MS4 Permit
Monitoring	Monthly monitoring for macroalgal percent cover and biomass sampling.
Results Reported	Targets have been reached EXCEPT for Dissolved Oxygen
Outcomes	Since 2018, the macroalgal biomass target has been met and the dissolved oxygen target has not been met, Since 2018, based on watershed loading estimates, the annual nitrogen and phosphorus load reductions have been met.

Bell Creek

	Nitrates in Bell Creek (2020) **Region 3**
BU affected	MUN, COLD, WARM
Source	irrigation runoff from agricultural lands
Implementation	Conditional Waiver of WDRs Compliance with Ag order (including enrollment of owners and operators of irrigated lands, development of Farm Plans, development of Irrigation and Nutrient Management Plans)
Monitoring	**Monthly** monitoring Ag dischargers are responsible for their monitoring and are most likely a part of programs that assist them.
Results Reported	Conditions Improving
Outcomes	Load Allocation for nitrate as nitrogen has consistently been achieved at monitoring site

Project Schedule

- Public Workshop in Second Half of 2026
  - Cyanotoxin Objectives
  - Biostimulatory Objectives
- Future Workshops in 2027 & Later
  - Program of Implementation
- This is a Multi-Year Project
  - CEQA Scoping
  - Peer Review on the Science
  - Formal Public Comment