

Legislative Mandated Reports

2021 Water Code Section 13182(a) Report

Introduction

Algae and cyanobacteria can produce harmful compounds, such as toxins and taste and odor compounds, that cause health risks to humans and animals. When blooms pose a risk to humans, animals, and the environment, they are referred to as harmful algal blooms (HABs). We have current historical evidence of freshwater HABs occurring in California since at least 1925, when a dog fell ill after drinking water at Clear Lake -- the first report of an HAB dog sickness in the state's recorded history. The freshwater and estuarine HAB (FHAB) incidents are caused primarily by cyanobacteria, which have been around for millennia. The indigenous communities of what is now California have been aware of these and similar marine harmful algal blooms (aka "red tides," caused by a dinoflagellate) for thousands of years on the west coast but their long view on history concludes it was the introduction of water management activities during the European colonization of California that created conditions for a significant increase in the occurrence and severity of FHAB incidents in our basins.

In the past 40 years FHABs have grown in number, intensity, and duration, impacting the safety of our drinking water, tribal subsistence fishing, tribal tradition and cultural practices, fish and mussel consumption, recreational uses, and ecosystem health throughout the state and tribal lands. With greater than 3,000 lakes, 190,000 river miles, diverse ecosystems ranging from deserts to temperate rainforests, and over 40 million inhabitants, California faces a complex management issue for HABs. These impacts translate to the loss of attainment of up to ten beneficial uses in the California Water Code and unquantified economic impacts. With the loss of these beneficial uses, comprehensive statewide monitoring and management efforts are necessary to reduce the occurrence, duration, and severity of HABs in California.

To begin addressing the issue of the increasing occurrence and prevalence of FHABs in surface waters, the Surface Water Ambient Monitoring Program (SWAMP) at the State Water Resources Control Board (State Board) started developing a FHAB strategy. They also began coordination efforts and temporarily diverted resources in 2016 from existing SWAMP programmatic areas to address FHABs. This SWAMP effort that began in 2016 accomplished several key infrastructural and coordination milestones that have enabled the State Board to begin to protect public health by informing citizens of risks associated with HABs and identify water quality conditions degraded by HABs. This SWAMP effort was not formally staffed or funded and lacked support to fully address the complexity and growing prevalence of FHAB incidents across the state.

[Assembly Bill No. 834 \(AB 834\)](#) was approved by the Governor September 27, 2019 requiring the State Board to establish a Freshwater and Estuarine Harmful Algal Bloom Program to protect water quality and public health from HABs.

This report meets the requirements in section 13182(a) of the California Water Code as outlined below.

California Water Code Section 13182(a)

On or before July 1, 2021, post on the state board's internet website a report including the following information:

- (1) The incidence of, and response to, freshwater and estuarine harmful algal blooms in the state during the previous three years.*
- (2) Actions taken by the state board as required pursuant to paragraphs (1) to (5)¹, inclusive.*
- (3) Recommendations, by the state board and other entities participating in the Freshwater and Estuarine Harmful Algal Bloom Program, for additional actions, including preventative actions where possible, that should be taken to protect water quality and public health from harmful algal blooms, including recommendations for statutory or regulatory changes that are needed to achieve that goal.*

(1) The incidence of, and response to, freshwater and estuarine harmful algal blooms in the state during the previous three years.

Reporting System Infrastructure

The State Board manages the [Harmful Algal Bloom \(HAB\) Portal](#) (CA HABs Portal) as the central resource for FHABs in the state of California. The Portal is an informational website for the public and functions as a tool to support coordination with statewide partner entities to address FHABs. The content is developed by the State Board, participating agencies, and the [California Cyanobacteria and HAB \(CCHAB\) Network](#).

The CA HABs Portal also houses the [FHAB Incident Reports Map](#) (Web Map), maintained by the State Board, which provides data on voluntarily reported blooms in California. The Web Map includes reports under investigation and/or confirmed incidents of FHABs and is easily accessible to the public to receive near real time information that is updated daily.

Public Reporting System

Prior to formal legislation, the California Harmful Algal Bloom Report Form (Report Form) was made available on the State Board's website for use by the public and coordinating agencies to report suspected and confirmed FHABs. These reports are then verified by State Board and Regional Water Quality Control Boards (collectively the

¹ (1) Coordinate immediate and long-term event incident response, including notification to state and local decisionmakers and the public regarding where harmful algal blooms are occurring, waters at risk of developing harmful algal blooms, and threats posed by harmful algal blooms.

(2) Conduct and support field assessment and ambient monitoring to evaluate harmful algal bloom extent, status, and trends at the state, regional, watershed, and site-specific waterbody scales.

(3) Determine the regions, watersheds, or waterbodies experiencing or at risk of experiencing harmful algal blooms to prioritize those regions, watersheds, or waterbodies for assessment, monitoring, remediation, and risk management.

(4) Conduct applied research and develop tools for decision-support.

(5) Provide outreach and education and maintain a centralized internet website for information and data related to harmful algal blooms.

Water Boards) staff and published to the Web Map on the CA HABs Portal through the FHAB Reporting System. Refer to Table 1 for number of FHAB reports submitted by the public and coordinating agencies to the Water Boards over the last three years.

Table 1. Number of voluntary reports submitted through the On-line Report Form from 2018-2020

	2018	2019	2020
Total Reports	190	241	370

In 2018, the voluntary Interagency HAB-related Illness Workgroup (Illness Workgroup) was developed to investigate and track potential HAB-related illnesses in humans and animals throughout California. The Illness Workgroup includes staff from the Water Boards that coordinates with the Office of Environmental Health Hazard Assessment, the California Department of Public Health (CDPH), and the California Department of Fish and Wildlife. All bloom reports that involve a potential illness or mortality undergo further evaluation of the available environmental and health related information. Those that are considered HAB-related are submitted to the Centers for Disease Control and Prevention’s (CDC) [One Health Harmful Algal Bloom System](#) (OHHABS). Table 2 below provides the number of potential illness reports that the Illness Workgroup received from 2018-2020.

Table 2. Number of all potential illness reports* received

	2018	2019	2020
Dog	9	21	14
Livestock	0	2	0
Wildlife	6	3	2
Fish	7	9	10
Human	18	14	16
<i>TOTAL</i>	<i>40</i>	<i>49</i>	<i>42</i>

*Note: These numbers reflect illness reports initially received. A report may include multiple individuals.

Incident Response Procedures

For each bloom report received, staff at the Water Boards follow standardized incident response procedures. These procedures were developed by the State Board to provide consistent incident response and public communication statewide. Procedures include the following steps: (1) review and publication of a FHAB bloom report, (2) coordination of field investigation and communication with relevant agencies, (3) public health notification, and (4) coordination of advisory posting and follow up monitoring. Regional staff are primarily responsible for leading direct response within their region, while State Board staff provide support for response duties and development of statewide resources, procedures, and tools. Resources for the public and agency staff are housed on the CA HABs Portal.

Incident Response Findings

Over the past three years, public and coordinating agency reports of blooms have doubled. This rise in reports can be attributed to increased public awareness, water monitoring conducted by coordinating agencies, and the occurrence of FHABs. The public is becoming more actively engaged as reflected in Table 1 by the increase in submitted HAB reports, as well as increasing inquiries about local waterbody conditions statewide. With the drought conditions this year, the Water Boards have observed earlier reporting of blooms in waterbodies at risk of HABs, particularly in the North Coast and San Francisco-Sacramento Bay Delta. There has also been growing interest in collaboration by other agencies, including strategies to support and develop local HAB monitoring programs. Data and information gathered by collaborative monitoring programs are being used to assess waterbody conditions and inform the public of HABs. HABs are also receiving similar media attention as drought and wildfire, highlighting the growing concern across the state.

FHABs are increasing spatially and temporally throughout California. Data and information gathered through FHAB bloom reports show that spatially FHABs occur from the Oregon to Mexico borders, from high elevation landscapes to the coast, in urban and rural areas, and are detected in reservoirs, natural lakes, and rivers. For example, several drinking water reservoirs in the California State Water Project have reoccurring annual blooms. In addition, FHABs are becoming prevalent in areas with no known anthropogenic impacts that drive FHAB growth, such as alpine lakes.

Water Boards staff have observed an overall increase in the duration of FHABs statewide. Historically, bloom duration tended to dissipate in a matter of weeks to couple of months. Based on the data the Water Boards has collected from the HAB reporting system, waterbodies with HABs tend to persist for longer periods of time, often around 6 months, and in some regions they persist year-round. Since routine monitoring began, Lake Elsinore (Riverside County) has been observed to have year-round blooms, which severely impacts the recreation and irrigation uses of the community. Clear Lake (Lake County), the largest natural lake in California, has a community led HAB monitoring program that assesses impacts throughout the year to drinking water, tribal tradition and cultural practices, recreation, fishing, and agriculture. These impacts have substantial economic impacts to the drinking water purveyors due to increased water treatment costs and impacts to local tourism that relies on water recreation, particularly known for its prized bass fishery.

The limited resources over the past three years have been prioritized for initial incident response to conduct field investigations and collect the information needed to assess potential human health risk and recommend appropriate advisories to be posted at popular public waterbodies. The advisory postings provide recommendations to protect the public, particularly children and dogs since these groups are most susceptible to FHAB impacts during water recreation.

(2) Actions taken for Incident Response, Ambient Monitoring, Prioritization, Tools for Decision-Support, Outreach and Education

Program Initialization

Fiscal year 2020/2021 budget act authorized 5 new staff positions and \$750,000 in annual contracting funds. The staff positions are distributed among the State Board (2 positions) and three Regional Boards (1 position each at Regional Boards 1 [North Coast], 5 [Central Valley], and 6 [Lahontan]). These positions provide the initial resources for effective regional incident response, data collection, coordination with relevant agencies, advisory posting, and communication of public and environmental health data. These positions will continue to work with HAB coordinators at all other Regional Boards that did not receive dedicated resources.

Due to constraints presented by the Covid-19 emergency the approval of the budget change proposal (BCP) was delayed to November 2020. The hiring of the new positions by four different hiring managers throughout the state was prioritized. The two new positions for the State Board were filled in April and May 2021 and the three positions for the Regional Boards were filled by end of June 2021.

Coordinate Immediate and Long-Term Incident Response

Prior to formal legislation, the Water Boards developed standardized incident response procedures and tools. These resources are available through the CA HABs Portal for agency staff and the public. State Board staff also provide limited training opportunities to interested agencies, organizations, and the public to ensure that consistent use of the tools are used to monitor and assess bloom conditions. Trained partner entities support the Water Boards incident response process through water sample collection and advisory sign posting in areas not near Water Boards offices.

Water Boards staff are the intermediary for when bloom reports are received and triage the next applicable steps, whether it is recommending posting advisory signs, recommending sampling and/or support, or working with the water manager/landowner in developing a sampling plan to better protect public health and inform appropriate advisories. This information is then shared through the Web Map for public transparency and awareness.

It is anticipated that with the 5 new staff in place, triaging and response time to bloom reports can be reduced, and long-term response and monitoring can be increased. The data and information collected by long-term response and monitoring efforts will be critical in implementation of other key elements of the FHAB Program. Collectively, these improvements will support the Water Boards and collaborating entities to better protect public and environmental health from the impacts of HABs to drinking and recreational waterbodies.

Conduct and Support Field Assessment and Ambient Monitoring

Holiday Assessments

To protect Californians when water recreation is at the highest during the warm season and when HABs peak, the Water Boards and partner organizations perform pre-holiday assessments to monitor some of the more popular California lakes and rivers. The first year of three consecutive pre-holiday assessments started in May 2021 to proactively monitor popular recreational waterbodies prior to the Memorial, Independence, and Labor Day holiday weekends. Water quality conditions and relevant recreational advisories are shared through the Web Map and through press and social media.

Ambient Monitoring and Research

In early 2021, SWAMP funded and closely collaborated with the Southern California Coastal Water Research Project (SCCWRP) to release the report, *California Water Boards' Framework and Strategy for Freshwater Harmful Algal Bloom Monitoring*² (hereafter, Monitoring Strategy). This document lays the foundation for how to develop an ambient monitoring program for freshwater and estuarine HABs in California, a priority that was identified in SWAMP's 2016 FHABs Assessment and Support Strategy, but that had not been implemented by SWAMP. When work on the Monitoring Strategy began, AB 834 had not been approved and the available resources for FHABs monitoring were not yet established. Therefore, the Monitoring Strategy was written as a conceptual document to comprehensively consider all the monitoring options for the Water Boards. The Monitoring Strategy proposes many programmatic and special study recommendations for the Water Boards including efforts to support implementation of monitoring, research, and risk assessment objectives under AB 834. With the initial financial and personnel resources allocated through AB 834 and the BCP, the Water Boards can begin to prioritize which Monitoring Strategy recommendations to implement in line with AB 834 requirements.

Regional studies are being conducted to assess priority waterbodies and inform local management decisions and actions. These studies have been designed by the Regional Boards (with support from the State Board) to inform various management objectives and questions including, but not limited to, bloom status and trends, magnitude of toxicity and relationships between regional and watershed biostimulatory conditions and FHABs. These regional studies have been supported by AB 834 funds and supplemented with Water Board funds.

Identify and Prioritize at Risk Areas

Before the formalization of the Program, volunteer monitoring for FHABs was prioritized in areas where there have been willing partner entities with resources to address FHAB occurrences in drinking and recreational waterbodies. Water Boards focused efforts on waterbodies with persistent concerns or where an illness was identified. The priority

² Smith, J., Sutula, M., Bouma-Gregson, K., & Van Dyke, M. (2021). *California Water Boards' Framework and Strategy for Freshwater Harmful Algal Bloom Monitoring: Full Report with Appendices* (SCCWRP Technical Report 1141.B). Southern California Coastal Water Research Project.

was, and continues to be, communication of HABs information to the public. Monitoring data is shared to the Web Map and upon confirmation of the bloom, the Water Boards coordinate response to the incident.

With the formal Program in the early stages of development and the permanent staff hired, it is anticipated that further risk assessment and prioritization actions will be implemented. In particular, implementation of the Monitoring Strategy key recommendations (e.g., expansion of routine, collaborative monitoring efforts) will provide the Water Boards with critical data and information needed to inform decisions and actions related to the identification and prioritization of waterbodies most at risk.

Conduct Applied Research and Develop Tools for Decision-Support

Data gaps that must be filled to effectively implement other AB 834 mandates will be addressed through research studies organized by the State Board with recommendations and review by the Regional Boards. Additionally, data analysis and synthesis tasks such as FHAB risk models or status and trend assessments, will be conducted by State Board staff in collaboration with Regional Board staff. Previous SWAMP funds were allocated to leverage satellite imagery data available from federal agencies. With this data, Water Boards and a contractor developed a [web-based FHAB satellite tool](#) that displays remotely sensed bloom data, which is used as a screening level analysis tool by the Water Boards and coordinating agencies. The satellite tool presents processed satellite imagery for approximately 250 waterbodies in California large enough to be detected by the satellite. The remotely sensed data can be used to support applied research and tool development such as informing risk models and status and trends assessments.

Provide Outreach and Support and Maintain Website

The Water Boards uses the CA HABs Portal as an informational resource for the public and to support coordination with statewide partner entities to address FHABs. It contains the Web Map that is maintained by State Board staff, as well as several fact sheets to answer frequently asked questions by various audiences. Due to limited funding prior to the BCP and AB 834, outreach and education has been performed on an ad-hoc basis or upon request resulting in approximately 6 training events annually. In the coming years it is anticipated that a more coordinated approach to outreach and education will be instituted with additional outreach to the public, community groups, local agencies, Tribal governments, and interagency personnel.

(3) Recommendations for Additional Actions

As a result of the timing of AB 834 and BCP approval (delayed due to the Covid-19 emergency) and due date for the legislative report, the Water Boards has established a phased approach to complete the report to legislature in two parts: (1) This report acts as the interim report by June 30, 2021, and (2) A comprehensive report will be completed by June 30, 2022 to allow for one full fiscal year of work supported by the program funds and permanent staff. Table 3 identifies reporting mechanisms for the FHAB Program.

Table 3. FHAB Program Reporting (published to public websites)

Type	Website	Frequency
Bloom Reports	CA HAB Portal webmap	daily
SWAMP Annual Workplan and Performance Report provided to U.S. EPA Region 9	SWAMP External Wiki	July 1, 2021 and annually
Interim and Ongoing Annual Program Reports <ul style="list-style-type: none">Year 2022 – Comprehensive Recommendations Report (for the legislature)Year 2024 – Three-year Adaptive Management Report (to evaluate Implementation Plan)	SWAMP HABs webpage	July 1, 2021 and annually

The Water Boards recommends the first two and half years of the Program focus on developing the foundation of the Program so it can expand in a sustainable and efficient manner; as such, a draft *Freshwater Algal Bloom Monitoring and Response Program Implementation Plan 2021-2023* (Implementation Plan) has been developed. As of July 1, 2021, the five permanent positions have been hired through the BCP, with the first hire in late April 2021. The 2019/2020 fiscal year of contracting funds has been allocated to support laboratory analysis and laboratory method development for statewide incident response and monitoring.

Future Needs

The initial resources allocated to the Program did not provide every Regional Board with permanent staff to address these legislative mandates and we anticipate that we will need additional place-based resources to adequately respond to regional needs and priorities. Despite these resource constraints, protecting public health is a priority and there are legislative minimums that must be met by the agency. Regional Boards will continue to lead incident response and coordinate with relevant agencies to assess bloom conditions, collect data to inform recreational health advisories, notify stakeholders and the public, and coordinate follow up monitoring to inform updates to advisory postings. State Board will continue to provide support for communication activities and to cover staffing deficiencies at the Regional Boards in providing incident response and monitoring of FHABs.

The Water Boards also understands the constraints of the current database output for the current FHAB Reporting System. Lacking resources at the time, the FHAB Reporting System only provides relevant information in near-time for the public but does not track: (1) increases and changes in FHAB incidents; (2) temporal aspects of FHABs to evaluate trends; (3) advisory changes at waterbodies (no advisory, caution, warning, danger); (4) water quality data; (5) performance of Water Boards response and voluntary posting; or (6) other outputs for reporting on FHABs in general.

Given no dedicated resources, the program was reactionary, focusing on initial priority needs first with incident response and public noticing. With the additional funding provided by AB 834, Water Boards staff are currently developing a new FHAB Reporting and Monitoring System to better track occurrences, trends, water quality data, and duration to inform future policy and management questions. This is in addition to

continuing with near-time public noticing of FHABs on the Web Map, which received approximately 34,000 views during 2020.

Data collected from the future FHAB Reporting and Monitoring System will be used by Regional Boards to determine initial at-risk waterbodies to prioritize notifications to local entities and prioritize outreach to water/land managers. The State Board will lead the development of tools and provide training to the Regional Boards to support future comprehensive watershed and waterbody scale risk assessments. Contractors will develop methods and procedures to support development of statewide monitoring at multiple scales and utilize remotely sensed data for statewide assessments conducted by the Water Boards. These supporting methods and procedures are anticipated to be completed by end of 2022/2023 fiscal year.

Regional Boards will continue to lead coordination of outreach and State Board will provide support and relevant presentation or technical materials. With new identified outreach needs, State Board will develop additional materials to continue providing a consistent approach throughout the state.

To adaptively manage the Program and ensure implementation of AB 834, the Implementation Plan will be regularly reviewed and updated. For the update in 2024, Water Board staff will review deliverables and progress and enlist the assistance from collaborating agencies and stakeholders to ensure the Implementation Plan address AB 834 requirements and the evolving needs of the FHAB Program.

The creation of HABs-related standards for public health and water quality is critical to achieving the requirements of the Program, supporting the Water Boards mission, and protecting the people of California. The development of these standards was in AB 835 (Quirk, 2019) and was not approved that year. Currently, the public health advisory levels are voluntary and not endorsed by a state agency, thus, there is disparate voluntary compliance statewide.