STATE OF CALIFORNIA
REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL COAST REGION

STAFF REPORT FOR REGULAR MEETING OF APRIL 20-21, 2023
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ITEM NUMBER: **10**

SUBJECT: **Update - Freshwater and Estuarine Harmful Algal Bloom Program**

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KEY INFORMATION

Location: Region-Wide Surface Water Monitoring

ACTION: **Information/Discussion**

SUMMARY

This is an informational item to provide an update on the State Water Resources Control Board's (State Water Board's) Freshwater and Estuarine Harmful Algal Bloom Program (FHAB Program)[1], implemented by the State Water Board and Regional Water Quality Control Boards (Regional Water Boards). Freshwater and estuarine harmful algal blooms (FHABs), are defined as an overgrowth of cyanobacteria or eukaryotic algae, that occur throughout California. When cyanobacteria bloom and produce cyanotoxins, they threaten drinking water supplies, wildlife, domestic animals, and human health. Blooms can also result in negative socioeconomic impacts on surrounding communities. FHABs are negatively impacting beneficial uses in California surface waters, including drinking water, recreation, tribal and cultural uses, agriculture, and aquatic life. The degradation of these uses has broad and sustained economic impacts.

Most inland surface waterbodies are not routinely monitored for FHABs. As a result, there is limited understanding of the extent of FHAB risks to beneficial uses. Severe and chronic FHAB impacts have been documented in every county in California and in some cases, are persistent year-round. Additionally, FHAB impacts compound other adverse conditions in underrepresented communities, including limited access to recreational

[1] https://www.waterboards.ca.gov/water_issues/programs/swamp/freshwater_cyanobacteria.html

opportunities and clean drinking water. In September 2019, the Governor signed Assembly Bill (AB) 834, which added Section 13182 to the Water Code establishing a FHAB Program. Water Code section 13182 requires the State Water Board to establish a formal program to protect water quality and public health from harmful algal blooms in consultation with state and federal agencies, and California Native American Tribes.

In the Central Coast Region, monitoring for FHABs occurs seasonally, prior to high use recreation weekends as part of statewide monitoring events scheduled for pre-Memorial Day, pre-Independence Day (July 4th), and pre-Labor Day holidays. Limited funding from the State Water Board allows for reactionary monitoring, prioritized as incident response to FHAB bloom reports, to inform risks to public health. Additionally, when budgetary resources are more readily available, occasional ambient monitoring will also occur at established water quality monitoring sites when visual indicators of FHABs are present. The results of the 2022 preholiday screening and FHAB monitoring in the Central Coast Region resulted in recommendations to post health advisories for Lake San Antonio, Oso Flaco Lake, Laguna Lake, and Santa Margarita Lake.

As part of this item, State Water Board staff will present an overview of the FHAB Program, and Central Coast Regional Water Quality Control Board (Central Coast Water Board) staff will present a summary of the regional implementation and results.

DISCUSSION

Background

What are freshwater harmful algal blooms and why are they a problem in California?

Cyanobacteria and eukaryotic algae naturally occur in all aquatic systems and are the foundation of food webs that support aquatic life in our lakes, rivers, estuaries, and oceans. Under certain conditions, some species can reproduce very quickly and rapidly accumulate biomass, in what are commonly referred to as “blooms.” FHABs are defined as blooms with any negative consequence (to society or an ecosystem) that occur because of cyanobacteria, macroalgae and/or eukaryotic algae. While FHAB species are naturally occurring, human activities can alter the environment in ways that promote FHABs to increase their magnitude, frequency, duration, and/or extent.

The negative impacts of FHAB events can be caused in two main ways: 1) the production of toxins that can harm ecosystems including wildlife, humans, dogs, and domestic animals, and 2) high biomass that accumulates in aquatic habitats. Both toxic and non-toxic blooms can cause negative environmental effects such as clogging or impairment of gill function in aquatic organisms, benthic habitat alteration, impairment of navigation and/or recreation, light attenuation, or depletion of dissolved oxygen. FHABs impact multiple beneficial uses including recreation, aquatic life, and drinking water by reducing aesthetics, lowering dissolved oxygen concentration, causing taste and odor problems, and producing potent toxins.

In California, FHABs have been a growing issue throughout the state, particularly in the Klamath River watershed, Clear Lake, Sacramento and San Joaquin River Delta, reservoirs in the State Water Project, Lake Elsinore, San Francisco Bay Area lakes, as well as Pinto Lake in the Central Coast Region. The rate of voluntary reporting of blooms statewide to the Water Boards has increased significantly, with the expectation that voluntary reporting will continue to increase. Reporting to the Water Boards also includes cases of potentially FHAB-related illnesses (ranging from humans, domestic animals, and fish and wildlife) that are investigated by an interagency workgroup to collect the data for reporting to the Centers for Disease Control and Prevention (CDC). A notable case study of animal illness in the state involves the deaths of more than 30 endangered sea otters in Elkhorn Slough and Monterey Bay that were linked to ingestion of a freshwater toxin, microcystin, from an inland freshwater waterbody that bioaccumulated in marine bivalves (Miller et al. 2010; Kudela 2011).[2]

This staff report focuses on FHABs, however marine harmful algal blooms (sometimes referred to as a red tide) also occur and people and animals can be exposed to marine algal toxins through food, incidental ingestion, inhalation, and skin contact. For information on marine (coastal) HABs, including red tides, please refer to the California Harmful Algal Bloom Monitoring and Alert Program (CalHABMAP)[3] and California Department of Public Health's (CDPH's) Marine Biotoxin Monitoring Program[4] webpages.

Harmful Algal Bloom Exposure and Health Impacts

Human exposure to FHABs most commonly occurs through ingestion of drinking water and incidental ingestion or skin contact with contaminated water while swimming, boating, or doing other activities in or near water with a bloom. Inhalation of spray or mist coming off water with high cyanotoxin concentrations may also contribute to exposure during activities such as boating or jet-skiing. Cyanotoxins may also accumulate in fish and shellfish tissues that humans consume causing illness. Children are considered more susceptible to effects from cyanotoxin than adults because they tend to play in areas where FHABs accumulate on the shoreline and accidentally or intentionally consume more water when recreating. Currently, there are no clinically available diagnostic tests for cyanotoxins or treatments for illnesses caused by FHABs. If people show symptoms of cyanotoxin and/or cyanobacteria exposure after contact with water, or with scums or mats of algae, they should receive immediate medical attention. State Water Board FHAB Program staff participate in an Interagency FHAB-related Illness Workgroup that investigates and tracks potential FHAB-related illnesses in humans and animals and reports to the CDC's reporting system. For more information on the human health impacts of FHABs, go to the Freshwater Harmful Algal Bloom-related Illness Tracking in California webpage.

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[2] https://pubmed.ncbi.nlm.nih.gov/20844747/
[3] https://calhabmap.org/
[4] https://www.cdph.ca.gov/Programs/CEH/DRSEM/Pages/EMB/Shellfish/Marine-Biotoxin-Monitoring-Program.aspx

Pets, livestock, and other animals may have more severe symptoms than humans, including paralysis and sudden death. Related resources and information are available on the State Water Board's Pets, Livestock, and FHABs[5] website.

There are no federal or state numeric regulatory standards for toxins produced by FHABs in drinking or recreational water. However, an interagency subcommittee under the California Cyano-HAB Network[6] (CCHAB), a working group of the California Water Quality Monitoring Council, developed standardized voluntary guidelines for responding to FHABs in recreational waters in 2016. The FHAB Program implements these guidelines and associated trigger levels[7] and signage for posting recreational health advisories. Lab testing is required to determine the potential health risk of FHABs; there are no visual methods to detect and quantify toxins. The United States Environmental Protection Agency (US EPA) issued health advisory levels for two classes of cyanotoxins in drinking water in 2016 and recreational criteria in 2019, however, neither of the sets of thresholds are regulatory standards and do not include the range of cyanotoxin classes commonly measured in California. The Office of Environmental Health and Hazard Assessment (OEHHA) has recently developed acute notification level recommendations for four cyanotoxins in drinking water[8] that the State Water Board's Division of Drinking Water is considering for adoption. Additionally, cyanotoxin data from voluntary testing reported to the Water Board's database are being assessed for California's Integrated Report using evaluation guidelines per the State's 303(d) listing policy and the Total Maximum Daily Load (TMDL) Program. Unlike much of the data that is assessed from ambient monitoring programs, there is no comprehensive ambient monitoring program at the state or regional scales for FHABs, so the majority of the data available for assessment is from voluntary third-party or reactionary single-event monitoring.

State Water Board FHAB Program staff support and coordinate with Regional Water Board staff, Tribes, County Environmental/Public Health departments, state and federal agencies, and waterbody managers to respond to bloom reports and work with partner agencies when blooms occur. Often, this response is focused on preliminary evaluation and monitoring of the waterbody to inform the initial advisory for threats to human health. Continual monitoring to assess toxin production for the duration of the FHAB is necessary to inform appropriate public health advisories, however, it usually does not occur as the response guidelines are voluntary.

FHAB Assessment and Support Strategy

In 2016, the State Water Boards Surface Water Ambient Monitoring Program (SWAMP) took initial steps to respond to the growing problem of FHABs by developing a statewide FHAB Assessment and Support Strategy and implementing components without

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[5] https://mywaterquality.ca.gov/habs/resources/domestic_animals.html
[6] https://mywaterquality.ca.gov/monitoring_council/cyanohab_network/
[7]https://mywaterquality.ca.gov/habs/resources/docs/trigger_levels_and_response_decision_tree_for_planktonic_blooms.pdf
[8] https://oehha.ca.gov/water/report/notice-availability-acute-notification-level-recommendations-four-cyanotoxins-drinking

dedicated funding. In 2021, SWAMP in coordination with the Southern California Coastal Water Research Project (SCCWRP), developed a more comprehensive Framework and Strategy for Freshwater Harmful Algal Bloom Monitoring[9] (Monitoring Framework) which includes specific recommended actions to address key management questions related to five core beneficial uses: swimmable (contact/non-contact recreation), fishable, aquatic life, raw water sources, and tribal tradition and culture. It is important to note that only small components of the Monitoring Framework are being implemented with currently available resources.

The State Water Board is the primary coordinating agency with multiple partner entities that are each assessing specific waterbodies following a suite of standardized methods. Partners include Regional Water Boards, Tribes, local environmental health departments, parks departments, drinking water agencies, private waterbody managers, scientific non-governmental organizations (NGOs), and community science groups. FHAB monitoring data is critical to protect public health and is also an important tool for local, state, and federal governments, and various community, stakeholder, and tribal groups with an interest in protecting beneficial uses that are impacted by FHABs. More detailed information is available in the Fact Sheet - California State Water Boards' Framework and Strategy for Freshwater Harmful Algal Bloom Monitoring (Attachment 1). In addition, a description of program accomplishments and a current gap assessment are included in the 2022 Legislative Report[10].

Assembly Bill 834 – Established Freshwater and Estuarine Harmful Algal Bloom Program

In September 2019, the Governor signed Assembly Bill (AB) 834, which added Section 13182 to the Water Code establishing a formal FHAB Program. Water Code section 13182 requires the State Water Board to establish a formal program to protect water quality and public health from harmful algal blooms in consultation with state and federal agencies, and California Native American Tribes. Building upon existing efforts, AB 834 requires the State and Regional Water Boards to implement the following six components: 1) event response, 2) statewide assessment, and monitoring, 3) risk assessment, 4) research, 5) outreach and education, and 6) reporting. The mandated FHAB Program provided funding for the placement of two staff at the State Water Board, one staff each at Regions 1, 5, and 6, and $750,000 in annual contract funding. The California Department of Fish and Wildlife also received one staff. The Central Coast Water Board did not receive any staff resources to implement the FHAB Program. The State Water Board provides limited funding for laboratory testing of surface water during high recreational months and incident response activities.

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9 https://ftp.sccwrp.org/pub/download/DOCUMENTS/TechnicalReports/1141_FHABStrategy_FullReport.pdf

10 https://www.waterboards.ca.gov/water_issues/programs/swamp/docs/2022/2022-legislative-mandated-report-final.pdf

California Harmful Algal Blooms (HABs) Portal

The California HABs Portal[11] is managed by the State Water Board as the central resource for FHABs in the state of California. The Portal is an informational resource for the public and also functions as a tool to support coordination with statewide partners to address FHABs. The Portal includes an HAB Incident Reports Map[12] which provides up-to-date information on voluntarily reported blooms in California. The State Water Board coordinates responses to reports with the Regional Water Boards and local agencies and may conduct follow-up field investigations and water testing to inform a recreational advisory. Where noted, recommended health advisories and corresponding signage are based on California voluntary guidance for recreational waters.[13] The FHAB Program staff provide support to help respond and communicate when blooms occur, and share data on the interactive HAB Incident Reports Map to alert the public and waterbody managers of the risks associated with each HAB event.

FHAB Monitoring in the Central Coast Region

The Central Coast Ambient Monitoring Program (CCAMP) is the Central Coast Water Board's regionally scaled water quality monitoring and assessment program. CCAMP also serves as a component of the State Water Board's Surface Water Ambient Monitoring Program (SWAMP) and coordinates with the State Water Board FHAB Program to conduct FHAB monitoring at a subset of local waterbodies located in the Central Coast Region. CCAMP also provides notification, guidance, training, and outreach materials to local waterbody/recreational managers and various partners to allow for appropriate and timely responses to FHABs.

CCAMP conducts FHAB monitoring at a subset of local waterbodies prior to high recreation holiday weekends including Memorial Day, Independence Day (July 4th), and Labor Day. FHAB monitoring efforts focus on waterbodies where swimming, fishing, and domestic pet recreation occur. In 2022, CCAMP conducted FHAB monitoring at the following waterbodies in the Central Coast Region: Lake San Antonio, Lake Nacimiento, Santa Margarita Lake, Laguna Lake, Lopez Lake, and Oso Flaco Lake.

When visual indicators of FHABs are present and laboratory results indicate harmful toxin levels (or positive microscopic identification of toxin-producing species), CCAMP staff provide recommendations and resources to local partners and waterbody managers to consider posting precautionary and advisory signs. Results from the 2022 Statewide FHAB holiday assessment resulted in a recommendation to post health advisories for Lake San Antonio, Oso Flaco Lake, Laguna Lake, and Santa Margarita Lake.

In coordination with the State Water Board, CCAMP continues to work with local partners and waterbody managers to facilitate FHAB monitoring efforts, assist with sample analysis, and provide guidance and recommendations for posting appropriate advisories to inform the public of the health risks associated with FHABs. Since there is

[11] https://mywaterquality.ca.gov/habs/index.html
[12] https://mywaterquality.ca.gov/habs/where/freshwater_events.html
[13] https://mywaterquality.ca.gov/habs/resources/habs_response.html

no dedicated FHAB staff position currently assigned to the Central Coast Water Board, CCAMP will continue to assist with pre-holiday screening and bloom response monitoring to support statewide FHAB efforts in future bloom seasons, as resources are available. The Central Coast Water Board continues to participate and engage with the State Water Board FHAB Program and the California Cyano-HAB Network and will continue these activities into the future.

Human Right to Water

California Water Code section 106.3, subdivision (a) states that it is the policy of the State of California "that every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption, cooking, and sanitation purposes." On January 26, 2017, the Central Coast Water Board adopted Resolution No. R3-2017-0004, which affirms the realization of the human right to water and the protection of human health as the Central Coast Water Board's top priorities.

Human exposure to the cyanotoxins associated with FHABs can occur through the ingestion of drinking water. Additionally, drinking water sources impacted by FHABs require improved and higher cost treatment to remove these toxins from finished water products, and high biomass blooms and aquatic vegetation can impede municipal or industrial water intakes. The FHAB Program implements Resolution No. R3-2017-0004 by collecting critical data to protect public health and drinking water sources, and by making the data accessible to local agencies and the public.

Environmental Justice

Environmental Justice principles call for the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income in the development, adoption, implementation, and enforcement of all environmental laws, regulations, and policies that affect every community's natural resources and the places people live, work, play, and learn.

Swimmable uses are inherently associated with environmental justice issues, as DACs often have diminished access to swimming pools and thus might tend to seek out waterbodies with free access (e.g., flood control or irrigation canals, streams or lakes). The FHAB Program addresses environmental justice by prioritizing partner monitoring programs in DACs where the public often recreates in local waterbodies. The FHAB Program implements a pre-holiday assessment monitoring program each year, focusing on high recreational waters before major holidays to keep the public informed as to any health advisories. Tribal or subsistence fishing uses may also be impacted, and monitoring of fish and shellfish toxins can directly inform fish consumption advisories and fishery closures, a key action to protect recreational health. Additionally, the FHAB Program provides important information, advisories, factsheets, and posting templates in both English and Spanish.

The Central Coast Water Board implements regulatory activities and water quality projects in a manner that ensures the fair treatment of all people, including

Underrepresented Communities. Underrepresented Communities include but are not limited to Disadvantaged Communities (DACs), Severely Disadvantaged Communities (SDACs), Economically Distressed Areas (EDAs), Tribes, Environmentally Disadvantaged Communities (EnvDACs), and members of Fringe Communities.[14] Furthermore, the Central Coast Water Board is committed to providing all stakeholders the opportunity to participate in the public process and provide meaningful input to decisions that affect their communities.

Climate Change

The Central Coast Region faces the threat and the effects of climate change for the foreseeable and distant future. Climate change and local activities are combining to create an increased risk of FHABs to human health through recreation, fish/shellfish consumption, and drinking water. The National Oceanic and Atmospheric Administration (NOAA) National Centers for Coastal Ocean Science reports that FHABs are projected to increase as ocean surface temperatures rise and ocean acidification continues. Climate change also has the potential to increase the occurrence of FHABs due to lower water levels as a result of drought and increased water temperatures, so proactively addressing waterbodies that may be prone to blooms will be imperative. To proactively prepare and respond, the Central Coast Water Board will continue to prioritize public health by coordinating with the State Water Board and local partners to conduct FHAB monitoring at waterbodies with high recreational use and during prime recreational months, so that data can be made available to the public on the statewide HABs Incident Reports Map.

CONCLUSION

In California, toxic FHABs are a recurring and increasing threat to public health, domestic pets and livestock, and other beneficial uses. Climate change is exacerbating these threats. With the projected increases in temperature and drought conditions, FHABs will worsen significantly over the next several decades. The results of the 2022 pre-holiday screening and FHAB monitoring in the Central Coast Region resulted in a

[14] Disadvantaged Community: a community with an annual median household income that is less than 80% of the statewide annual median household income (Public Resources Code section 80002(e)); Severely Disadvantaged Community: a community with a median household income of less than 60% of the statewide average. (Public Resources Code section 80002(n)); Economically Distressed Area: a municipality with a population of 20,000 persons or less, a rural county, or a reasonably isolated and divisible segment of a larger municipality where the segment of the population is 20,000 persons or less with an annual median household income that is less than 85% of the statewide median household income and with one or more of the following conditions as determined by the department: (1) financial hardship, (2) unemployment rate at least 2% higher than the statewide average, or (3) low population density. (Water Code section 79702(k)); Tribes: federally recognized Indian Tribes and California State Indian Tribes listed on the Native American Heritage Commission's California Tribal Consultation List; EnvDACs: CalEPA designates the top 25 percent scoring census tracts as DACs. Census tracts that score the highest five percent of pollution burden scores but do not have an overall CalEnviroScreen score because of unreliable socioeconomic or health data are also designated as DACs (refer to the CalEnviroScreen 3.0 Mapping Tool or Results Excel Sheet); Fringe Community: communities that do not meet the established DAC, SDAC, and EDA definitions but can show that they score in the top 25 percent of either the Pollution Burden or Population Characteristics score using the CalEnviroScreen 3.0.

recommendation to post health advisories for Lake San Antonio, Oso Flaco Lake, Laguna Lake, and Santa Margarita Lake. Though significantly under monitored, FHAB data is critical to protect public health and is also an important tool to local, state, and federal governments, various community, stakeholder, and tribal groups that are interested in protecting beneficial uses that are being impacted by FHABs. Unfortunately, the lack of resources to support comprehensive statewide or regionally scaled monitoring programs limits the ability to implement a proactive, year-round, FHABs monitoring strategy that is necessary to assess impacts to beneficial uses and inform management decisions to address the drivers of blooms. Central Coast Water Board staff will continue to coordinate with the State Water Board FHAB Program and local partners to collect data and make information available to the public.

ATTACHMENTS

1. Fact Sheet - California State Water Boards' Framework and Strategy for Freshwater Harmful Algal Bloom Monitoring[15]

[15] https://ftp.sccwrp.org/pub/download/DOCUMENTS/FactSheets/1141_FHABStrategy_FactSheet.pdf