California Cyanobacteria Harmful Algal Bloom Network
January 31, 2024, 9:00 am to 2:00 pm
Virtual Meeting
Agenda with Minutes

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9:00 am **Welcome, Introductions, Announcements, etc. (10)**
Presentation begins at 0:00 of meeting recording.

9:10 am **Freshwater Harmful Algal Bloom (FHAB) Program Updates/Regional Updates (70)**
Presentation begins at 2:25 of meeting recording.

- 2023 FHAB Program Update, Marisa Van Dyke, Carly Nilson, SWRCB (20)

Notes:

- 2023 Holiday assessments: conducted pre-Memorial Day, pre-Independence Day, pre-Labor Day, and some post Labor Day.
  - Pre-Memorial Day: From 69 sampled sites there were 10 cautions (Planktonic) and only 1 toxic algae alert (Benthic).
  - Pre-Independence Day: From 82 sampled sites there were 11 cautions (Planktonic), 1 danger (Planktonic), and 1 toxic algae alert (Benthic).
  - Pre-Labor Day: From 128 sampled sites there were 14 cautions (Planktonic), 2 warnings (Planktonic), 3 dangers (Planktonic), and 11 toxic algae alerts (Benthic).
- The year 2023 had 468 total voluntary incident reports. Less reports came in for blooms in 2023, some less routine monitoring in hot spots due to less funding.
- New feature in the satellite imagery tool: Chl-a added summer of 2023. Can toggle between 10-day metric or just one day (helpful for field assessments).

- 2023 Regional Updates, Regional HAB Coordinators/Monitoring Entities, Regional Water Boards (50)

Notes:

- Region 1:
  - Routine monitoring = Klamath basin, big lagoon, Russian river.
  - Klamath basin: mid/late august timeframe had an increase in microcystins.
    - Yurok Tribe issued Level 1 and 2 advisories starting mid-September for lower river.
  - Big lagoon: 6 different cyanobacteria genera were found.

    - Benthic monitoring: evaluating and implementing tiered approach (developing SPATTs as sentinel samplers for cyanotoxins, visual assessments for cyanobacteria percent cover, and benthic mat collections to confirm bloom toxicity)
        - South fork eel river had anatoxins in SPATT and mats increase prior to cyanobacteria percent cover. In the Russian river SPATT concentration and mats were less.
    - Trainings: USEPA ROAR Training, Blue Lake Rancheria and Wiyot tribe, and North Coast Partner Trainings
- Region 2:
    - 16 incident responses, 8 confirmed HABs
    - 5 counties, 10 agencies (6 new ones)
    - 3 sickness reported, 1 confirmed.
    - 6 red tide responses
    - Site visits were conducted 6 times.
    - Holiday assessments: two resulted in caution advisories. This year will be based on different sites.
    - Partner monitoring: Rotary Nature Center at Lake Merritt and Incident Response Training
    - Red tide event: working on developing an incident response strategy.
- Region 3: Not present
- Region 4:
    - 8 incidents in 2023
    - Public reporting does not have an efficient way of contact… therefore, it is hard to develop relationships and receive well-rounded information.
    - Red tide event reported: someone must live in the community where the report is made of the red tide, otherwise it cannot be checked out.
    - Working on coastal HAB project
- Region 5:
    - Event responses: 36 bloom reports, 64% were from the public, 36% from other agencies.
    - HAB illness groups took on 15 cases where 6 were HAB related, 4 human illnesses, 1 dog death, and 1 fish death event.
    - Sampled 5 water bodies: 2 of them had advisories issued.
    - Partner monitoring: working with RTD (restore the delta). 7 sites were sampled. Results of strip tests did not have a lot of microcystins.
    - State parks gold field district: 5 sites sampled; anatoxin-a was detected in benthic mat samples during the 4 sampling events.
- Clear Lake update with Sarah Ryan:
    - A lot of sites were at cautionary/danger levels during the summer.
    - Been installing SPATT bags (benthic sampling) and seeing higher levels of cyanotoxins.
        - 8 creeks sampled.
- Region 6:

    - 3 dangers,11 cautions, 0 warnings
    - Partner monitoring: Inyo County Environmental Health
    - Continued Red Lake monitoring.
    - Holiday assessment summary: There were much higher numbers reported post-holiday.
- Region 7:
    - Was able to sample during the holiday assessments at 3 points throughout the year at the Sultan Sea.
        - 2 caution advisories at two sites
- Region 8:
    - Incident responses: several bloom reports
    - Monitoring and assessments: Big Bear Lake, Mill Creek, Lake Elsinore, and Lake Hemet
        - Big Bear Lake and Lake Hemet reached cautionary HAB advisory.
- Region 9:
    - Microcystins were the most prevalent in the reservoirs.
    - Used SPATT and collection of benthic mats in streams: anatoxins were detected in all 6 sites and 1 site had microcystins detected.
    - Highest concentrations and most frequent SPATT toxin detection: Temecula creek, Murrieta creek, Santa margarita river.
    - 2024 plans: continued response to bloom reports, pre-holiday sampling, and focus sampling efforts on smaller public ponds.
- East bay regional parks district:
    - Advisories: microcystins were the most common
    - Fish tissue surveys: collected largemouth bass and detected toxins in most liver samples, but no toxins were detected in filet samples.
    - Mitigation efforts: Azolla bloom in lake Anza
    - Hypolimnetic oxygenation system: still present in lake Anza.
    - Nutrient monitoring: Orthophosphate (key nutrients that predict cyanobacterial growth) and Nitrate in Lake Anza.
    - Mitigation in lake Temescal: monthly watershed nutrient monitoring and daily remote sensor data continued through 2023.
        - Monitored nutrients = orthophosphate and nitrate
    - Moving in 2024: continued treatment to lake Temescal, hoping to treat at lake Anza for the first time this year, working on product harvester protocols, continuing flagship programs.

10:20 am Break (10)

10:30 am **Eyes in the Sky Monitor Cyanobacterial Blooms in California Waters, Megan Coffer, NOAA (40)**

Presentation begins at 1:24:02 of meeting recording.

Notes:

- Satellite remote sensing compliment field-based monitoring which can increase coverage and offer early warning indications that can reduce costs associated with blooms.
- Cyanobacteria assessment network (CyAN): An interagency project between NOAA, NASA, USGS, and USEPA since 2015
- Ocean and land colour instrument (OLCI) = 300 m spatial resolution, near-daily revisit frequency, imagery collected in 21 spectral bands, cyanobacteria index computed per pixel
- A lake would need to have at least 10% of the pixels showing a sign of a bacterial bloom to be classified as experiencing a bloom.
- Occurrence maximum in summer and fall (33%) and minimum late winter/early spring (7%).
- Temporal frequency: can be useful for sampling prioritization as some lakes experience chronic blooms.
- Looking towards the future: CyAN 2.0
    - Multispectral instrument (MSI)
    - Onboard sentinel-2A and -2B
    - 10 to 60 m spatial resolution, 5-day revisit frequency, imagery collected in 13 spectral bands, Chl-a quantifiable per pixel.

11:10 am **Introduction to New US EPA Region 9 HAB Coordinator, Yeana Kwagh and Team, US EPA Region 9 (30)**

Presentation begins at 1:53:15 of meeting recording.

Notes:

- EPA authorities: safe drinking water act, clean water act, comprehensive environmental response, compensation, and liability act
- Region 9 HAB work currently: HAB communication plan, coordination across media programs, defining how EPA programs can help address HABs, providing input or facilitation support in workgroups, partnership building with other agencies and tracking needs, and supporting research with Office of Research and development.
- CWA 604(b) water quality management planning
    - Funds can be used to better understand and address HABs through planning activities such as conducting ambient monitoring, improving water quality standards, updating management plans, etc.
- CWA 106 Water pollution control program activities: water quality monitoring, outreach and education, and training/travel.
- Resources for developing water quality standards:
    - EPA nutrient scientific technical exchange partnership and support (N-STEPS)
        - Technical assistance for all stages or nutrients of criteria development

- Planning, scientific literature review, data preparation and analysis, model development, and peer review

- CWA 319 non-point source program
  - Activities include riparian area restoration/planting, wetland restorations, etc.
- San Francisco Bay program office
  - San Francisco bay water quality improvement fund: competitive grant program serving partners in the 9 bay area counties since 2008.
  - SF Bay Program office expansion
- Tribal set-aside for emerging contaminants in drinking water
  - Projects that address any contaminant listed in any EPAs contaminant candidate list are eligible for grants… including cyanotoxins.
- ORD HAB research
  - Early detection and management of cyanotoxins using qPCR.
  - Rick of toxic HABs across US lakes
  - One environment – one health: HABs, hypoxia, and nutrients research webinar series 2024
- Developing standardized methods for sampling, analyzing, and assessing benthic HABs
  - Regional ORD applied research project.
  - Conduct pilot studies in 7 EPA regions across the US at Streams or rivers that have recently experienced benthic HCBs.
  - Analyses include toxin analysis, cyanobacterial compositions, and areal extent and thickness.
- Wildfires and HAB research
  - EPA region 9 air and radiation division is involved in assisting ORD research in looking at wildfire deposition impacting downwind HABs.
  - Looking for a correlation between smoke plumes and elevated nutrients elevated in air samples on smoke impacted days.
- Region 9 lab support:
  - Free lab analysis of samples for microcystin using ELISA method.
  - The lab is looking to expand its capacity and capabilities for additional toxins analysis and drinking water methods in future.

11:40am **2023 CCHAB Subcommittee Updates (20)**

Presentation begins at 2:25:05 of meeting recording.

- Illness Workgroup Update, Dr. Shannon Murphy, OEHHA (5)

Notes:

- The Illness Tracking Work Group is comprised of 4 state agencies.
  - Investigates HAB related illnesses in humans, dogs, and wildlife.

- Mitigation Subcommittee Update, Hugh Dalton, City of Santa Cruz retired in 2021 (10)

Notes:

- Goals for 2024: Plan to study Lake Temescal, Lake Anza, Lake Wildwood, and Pinto Lake

- Benthic HABs Guidance Subcommittee Update, Carly Nilson, SWRCB (5)

Notes:

- Evaluating recent science and considering revisions to benthic guidance
- Expanded goals of benthic guidance to provide immediate event response, follow up monitoring, and routine monitoring.
- Conducted literature review for latest science and existing field protocols. Continuing to evaluate indicators and metrics of a potential new monitoring protocol.
- The workgroup's recommendations will be presented later this year for review and comment.

12:00pm Lunch (40)

12:40pm A Review of Algal Toxin Exposures on Reserved Federal Lands and Among Trust Species in the United States, Dr. Keith Loftin and Dr. Zach Laughrey, USGS (40)

Presentation begins at 2:43:04 of meeting recording.

Notes:

- No previous accounting of toxic algal bloom effects on federal lands
  - 259 million hectares of land
  - 75% of all federal land is managed by department of the interior bureaus.
  - Purpose of federal lands: access to natural resources, flood control, preserving national treasures and sensitive ecological areas, recreation, subsistence hunting, and abatement of invasive species.
- Evaluation of algal toxin events of federal land
  - The focus was on the harm due to toxin production only.
  - Data from: peer reviewed literature, government reports, state/agency databases, communication with agencies and bureaus, databases of national wildlife health center
- Tiered evaluation of algal toxin exposures in waters on federal lands:
  - Tier 1: an occurrence below threshold of concern
  - Teir 2: threshold exceeded triggering an advisory, warning, or closure.
  - Teir 3: animal morbidity or mortality
- Challenge to identify toxin effects in animals.
  - Remote areas make routine surveillance difficult, lack of resources to gather animals and determine cause of death, lack of field-based case definitions to readily identify potential toxin poisoning cases, predation of sick animals, and migratory nature of many animals.
  - This all likely means cases are under-reported.
- At least 11% of federal lands have algal blooms and/or toxins (1990s-present)
- 68 Trust Species have been exposed to at least 1 or 6 classes of algal toxins.

- Species documented to be exposed to the greatest number of algal toxins classes are bottlenose dolphins and Florida manatees.
- Summary:
    - Effects on federal lands were present, but likely under-reported.
    - Effect of trust species: 68 species affected by algal toxins, effects are throughout US (18 states), animal movement and migration connect private and public land exposure.
    - Are species exposed to algal toxins good sentinels for ecological and human health? Important to have early warnings.

1:20 pm **Microcystin in Delta Shellfish, Dr. Ellen Preece and Dr. Janis Cooke, DWR and Central Valley Water Board (40)**

Presentation begins at 3:23:02 of meeting recording.

Notes:

- Microcystins in shellfish
    - Most common CHAB-forming cyanobacteria genus is Microcystis which often produces microcystins (MC).
    - Growing evidence that microcystins accumulate in a variety of shellfish.
- Microcystin in San Francisco estuary shellfish
    - Wild marine mussels positive for MCs during every month of the year in western portion of San Fransisco Estuary (SFE)
    - Caged mussels placed across the SFE from just within delta boundary to the west tested positive for MCs 82-100% of the time depending on the station.
- Upper San Francisco estuary/sac-San Joaquin delta
    - CHABs have been an annual occurrence in the delta since 1999.
    - Asian clams have spread throughout the delta – can reach densities in excess 10,000 organisms m2.
        - Replaced other common prey items for native species.
        - Humans and fish are known to consume Asian clams.
    - Introduced signal crayfish are benthic-dwelling, opportunistic omnivores that eat anything including Asian clams and mussels.
- Project overview
    - Determine if MC/saxitoxins (STX) are stressors on food webs and native fish including managed species.
    - Determine if MC/STX in shellfish present a risk to human consumers.
- Sampling sites: Sacramento River, Sherman Lake, Cache slough, etc.
    - Field methods: Sampled for 2 years.
- Lab methods
    - Elisa = enzyme linked immunosorbent assay. It is rapid and inexpensive, but prone to matrix effects.
    - The LC-MS = high performance liquid chromatography coupled with mass spectrometry can be used to identify and quantify specific congeners. It is highly

specific and less prone to matrix effects, limited standards available so may underestimate total MC.
    - Encountered issues when following established LC-MS microcystin extraction and clean-up procedures.
- Future Research Ideas:
    - Investigate low level toxin detections in shellfish, expand crayfish sampling, and consider shellfish from areas recognized as bloom hotspots.

2:00 pm **Adjourn**

Presentation ends at 3:56:22 of meeting recording.