Freshwater Harmful Algal Bloom (FHAB) Monitoring & Response Program

Virtual Training for the North Coast Region

Slide Captioning

1. Good morning, everyone. The training will be gin shortly. Please mute your lines and enter your name and affiliation in the chat box. The presentation will be recorded and shared along with today’s slides.
2. Good morning all, thank you for participating in today’s training for freshwater harmful algal blooms – or FHABs – in the North Coast Region. My name is Mike Thomas and I am the FHAB Monitoring & Response Program Coordinator. Many of you have met and worked with Rich Fadness, who is our Surface Water Monitoring Lead and has been instrumental in the development of our FHAB Program. Rich will be providing support today, both by participating in the Q&A session after the presentation but also by monitoring the chat for any questions you may have during the presentation.
3. Let’s go over the goal of today’s training. To begin, I just want to say that monitoring and responding to FHABs in our region would not be possible without the help of you all, our local partners. The Regional Water Board has conducted extensive monitoring since 2016 which has resulted in the release of reports with recommendations for a successful monitoring program. Because our regional funding is now shifting to other high priority monitoring projects in the next fiscal year, our goal today is to assist you in establishing or building out your FHAB programs so we can all provide greater coverage for this important issue.
4. Here is an outline of what we’ll cover in today’s training. I’ll start with a general introduction then work my way into the various surveillance and monitoring techniques, how to report and respond to HABs, our benthic recommendations, and the various resources we have available. We have saved a lot of our time today for questions and answers at the end of the presentation. However, if you want to type questions into the chat during the training, Rich will be on standby to respond.
5. Just so we’re on the same page, let’s look at our terminology. Although algae can be harmful in certain scenarios, mainly what we are referring to when we say “harmful algal blooms” or “blue-green algae” are toxin-producing cyanobacteria. As illustrated here on the left in this family tree, cyanobacteria are ancient life-forms with primitive cells structures and fall in the Domain Bacteria, whereas algae came onto the scene later in Domain Eukarya, and this also includes land plants, fungi, and animals including humans. Cyanobacteria have been key to the development of our oxygen atmosphere (through early photosynthesis), form the base of aquatic food webs, and are found everywhere from aquatic to terrestrial environments. Because cyanobacteria and algae look and act similar, the were previously lumped together, however, these are very different organisms.
6. So when we refer to “harmful algal blooms” in the North Coast Region, we are usually referring to a proliferation of cyanobacteria in water. These blooms have several negative impacts including: impacts to ecosystem function through fish kills or altering the food web; they are not visually appeasing so there may have economic impacts to real estate and recreation; and blooms also affect drinking water resources by producing taste and odor compounds. But cyanobacteria are generally termed “harmful” because they can produce toxins that impact humans and animals through skin contact, inhalation, or ingestion. Toxin-producing cyanobacteria will be the focus of today’s training.
7. Here are the common classes of cyanotoxins that can be found in the environment. Each class has different toxic effects that either target the nervous system, liver, and/or kidney. Cyanotoxins can also illicit skin reactions through contact. Health effects vary from rashes, headaches, flu-like symptoms and gastrointestinal illnesses, but can also be fatal in extreme cases. There are also several different variants or congeners within a cyanotoxin class that vary in their toxicity. As you can see, microcystins and nodularins have over 200 variants while anatoxins have only four documented variants. Much of the focus in the North Coast Region, especially in rivers, is anatoxins and microcystins/nodularins.
8. When discussing HABs, we need to keep in mind that there are two general types of blooms: planktonic and benthic. Planktonic HABs are your floating cyanobacteria that grow suspended in the water column and can appear as green water, spilled paint, or small grass clippings, and dense blooms can form scums at the water surface. Planktonic blooms are generally associated with lakes and reservoirs; however, some planktonic blooms can form in large, slow-moving rivers. Benthic blooms, which are generally of most concern in the North Coast Region, are cyanobacteria that grow attached to bottom substrates, then subsequently detach and float to backwater areas or beaches. Benthic cyanobacteria are commonly associated with rivers and streams, but can also occur in lakes and reservoirs.
9. So, when discussing the FHAB Program, we need to identify the roles of each agency. Generally, the North Coast Regional Water Quality Control Board (RB1) advises FHAB response for our local partners; this includes providing technical support, recommending recreational postings based on monitoring results, updating the State Board’s database and webmap, and conducting public outreach and trainings like these. Our local partners, such as you all, lead the response and are essentially boots on the ground: you conduct site visits, collect data, and place physical signs at bloom locations. With our regional funding and long-term monitoring set to decrease at the Water Boards, our ultimate goal is to assist you in establishing your own FHAB monitoring programs.
10. So it goes without saying that we are very fortunate to have several partners in the North Coast Region at the local, tribal, state and federal level. Without this collaboration, the FHAB Program would not be possible.
11. This flowchart shows how the various agencies at the state and local level are intended to interact with each other. The Regional and State Water Boards coordinate the HAB response, while the Office of Environmental Health Hazard Assessment (OEHHA), Department of Public Health, and Fish & Wildlife are looped in if any human and animal illnesses are reported. Local partners, whether it be Tribes, County Health Departments, or Waterbody Managers, really lead that local response. The Division of Drinking Water (DDW) will be notified if there are any drinking water issues so water purveyors can take the appropriate action. This collaboration among agencies and partners feeds into our State Reporting System, which then transmits information to the public via our webmap.
12. I apologize that the text is so small, but here is a flowchart that shows the general steps for HAB monitoring, similar to our outline for today’s training. It starts with a suspected bloom, then we proceed to visual monitoring and simple field tests to confirm whether cyanobacteria are present. If present, a bloom report should be submitted so this information can be displayed on our public facing webmap. Sample collection, following the appropriate standard operating procedures (SOPs), and laboratory analysis occurs so data can be compared to recommended trigger levels and the appropriate signs posted.
13. We realize resources are limited and cyanobacteria may occur in any waterbody, so we are prioritizing publicly accessible rivers and lakes with high recreational and drinking water uses. None of us really have the resources to provide sampling or analytical support for private waterbodies, however, we do have a list of services that can be shared if they would like to conduct their own monitoring. We aim to protect public health, especially sensitive groups such children and pets. As you can see in this video, benthic cyanobacteria can easily be ingested by children at any public swim beach just due to their water recreating behavior.
14. So moving into that first step in the flowchart: visual monitoring. Because harmful cyanobacteria and harmless green algae appear similar, visually identifying cyanobacteria is critical to any monitoring program.
15. Prior to going into the field, remember that your health and safety are paramount. Do not put yourself at risk to HAB exposure or other dangerous field conditions such as wildfires or aggressive wildlife. If you can sample safely, be sure to use safety gear to reduce contact, inhalation, or incidental ingestion.
16. Here is our Field Guide found on the My Water Quality webpage. We recommend that our partners review and print-out the following resources prior to heading into the field. There is a wealth of information that can be initially overwhelming on My Water Quality, however, each resource is tailored to each component of a HABs investigation.
17. Also, we have our FHAB Program Wiki page that narrows down the resources our partners need for monitoring. I highly recommend that you bookmark this page, and I’ll be sharing several reminders to do so during our training. If I can, I’m going to take a moment to exit the presentation and bring up this wiki page as well as share the link in the chat.
18. There can be a lot of different green growths in the water, so we have developed visual guides to help our partners distinguish between harmful cyanobacteria and harmless algae or plants. We have a lengthy SOP, shown on the left, as well as a handy two-pager fact sheet, shown on the right. Be sure to have these in the field with you if you are unfamiliar with identifying cyanos.
19. So what are you looking for in terms of planktonic cyanobacterial blooms? Here are some pictures of planktonic HABs in the area. You can see that they are comprised of small floating organisms that turn the water green or may look like small grass clippings that can chunk together. Planktonic cyanobacteria can also form scums on the water surface and wash up on the shoreline and leave a turquoise-like paste. They may also plume or look like spilled paint and almost give the water a swirling effect.
20. Here is a full screen photo showing how these small organisms proliferate to turn the water green and make swirls. It’s almost like a lot of pollen diffuse in the water and on the water surface.
21. The appearance of harmful cyanobacteria contrasts with that of plants or harmless green algae that may float on or near the water surface; these can take on several appearances, as seen in the pictures provided in the visual guide factsheet. A lot of reports we receive involve filamentous or plant-like algae, shown on the left, as well as floating plants like azolla, shown on the right.
22. I threw in some slides of what cyanobacteria may look like under the microscope in case any partners wanted to conduct their own identifications this way. This is a very high-level look at common planktonic species, and the various cell structures that are used to differentiate them. Please refer to more in-depth guides to conduct formal identifications. Microcystis is cyanobacteria bound within a mucilaginous sheath. Dolichospermum is filamentous with cell differentiation, including heterocytes for fixing nitrogen, and resting cells called akinetes.
23. Gloeotrichia is spherical and almost looks like a starburst. Cylindrospermopsis is filamentous with terminal heterocytes.
24. When monitoring for benthic cyanobacteria, which is the main concern in our North Coast rivers, we are primarily looking for three genera of concern: Anabaena, Microcoleus (Phormidium), and Oscillatoria. Anabaena, shown here, commonly form “bubble towers” when photosynthesis creates bubbles in the mat matrix. They are commonly found in shallow, backwater areas or along river margins with low flow. They may be growing in or among filamentous green algae. When disturbed, these bubble towers are easily dislodged and can float downstream and accumulate along beaches and shorelines.
25. Here is what Anabaena looks like under the microscope: filamentous, no branching, cell differentiation with heterocytes and akinetes, indented cross walls so cells look bubbly, and sometimes pointy ends.
26. Another benthic genus, Microcoleus, includes some species previously or currently identified as Phormidium. These genera can form velvety or fan-like mats on the bottom surfaces. Individual cells of some species can become highly specialized and function as a holdfast or thallus, shown here in the bottom right picture. Microcoleus are commonly found in swift, riffled sections adhered to cobbles and boulders or growing on mats of green algae. As mats thicken and/or lengthen, they are more easily detached than initial growth stages. As you can see, this Microcoleus mat has grown enough that it moves in the streamflow; this mat can easily detach through disturbance and float downstream to areas frequented by people and pets.
27. Here is Microcoleus that may appear as a dark brown, as shown in the pictures on the right. In the video, you will see Microcoleus covering most of the benthic surfaces at this particular site, as well as detaching and floating to the water surface.
28. Here is Microcoleus under the microscope: filamentous, no branching, no cell differentiation, cell width is about the same as length so pretty square, sometimes has a sheath, sometimes pointed end with trichrome, and often motile on the slide.
29. Here we have Oscillatoria which can be brown or fuzzy-like mats on the benthos. The top right photo shows how mats of Oscillatoria can be interspersed with harmless green algae. In the video, Oscillatoria almost appears to me like a clump of algae. These are commonly found on sandy or silty section of the river where there is shade and slower flow. They also can grow on tree roots as seen in the video. Oscillatoria mats are also easily detached through recreational disturbance.
30. Here is Oscillatoria under the microscope: filamentous, no branching, no cell differentiation, cells are wider than they are long, giving it the appearance of stacked coins.
31. Distinguishing between harmless green algae and harmful cyanobacteria can be difficult, though with training and the help of visual guides, it can become somewhat second nature. Here we have a side-by-side of harmless and harmful, both which look like a floating green mess. However, certain visual indicators such as color and mat structure give it away. Harmless green algae is generally a brighter green and can turn yellow brown when senescing or dying, while cyanobacteria shown on the right are generally darker like a forest green. Harmless green algae is also stringier like wet hair, while the cyanobacteria usually breaks into smaller clumps. We’ll discuss these distinctions in the next section.
32. Here is a sight that seems all too common these days, and what probably generates the most bloom reports in our region. If you are looking out over this river, your first reaction is undoubtedly going to be “this is an algal bloom.” In some ways, you are correct, however, this is mostly the stringy and harmless green algae, and not toxin-producing cyanobacteria. It is important to note that although you are seeing mostly harmless green algae, there may be pockets of cyanobacterial mats within or among the green algae.
33. Here’s another shot of what you may see in the river. At first glance, again, it just looks like a lot of green stuff. But if you start looking closely, you can see that the harmless green algae is a brighter green, either occurring as stringy filaments in the mid-channel when it’s attached, or as stringy and light green when detached and accumulating along the bank. The cyanobacteria is darker green, forming bubble towers while attached, or as floating forest green clumps among the green algae.
34. Satellite imagery is another handy tool for visual monitoring, specifically for larger lakes and reservoirs. Sensors on several satellites can detect cyanobacteria due the unique spectral signature of their pigments. A new feature also allows us to see algae by detecting chlorophyll pigments. Once processed, satellite imagery can provide a heatmap showing maximum densities to occur at that location during a 1- or 10-day window. Spatial resolution is low, so this imagery is limited to the largest 250 waterbodies in the state. The California HABs Portal hosts the Satellite Map where users can view imagery and associated stats. Satellite imagery should be interpreted with caution. As listed here, there are several interferences and factors that need to be considered. California does not use satellite imagery to recommend postings, however, it can be used to determine whether a field visit is necessary.
35. Once you have visually identified a bloom of concern in the field, there are several simple field tests that you can conduct to further differentiate whether you are looking at harmless green algae or potentially toxic cyanobacteria.
36. Here is another reminder to bookmark the FHAB Program Wiki page.
37. The first test we’ll discuss is the stick test. The stick test takes advantage of the filamentous or stringy nature of harmless green algae. After locating a stick of sufficient length, try to lift bloom material out of the water. If you pull out strings that look like wet hair, you are likely dealing with harmless green algae. As seen in the on the right, planktonic or floating cyanobacteria does not string together and cannot be removed like wet hair. It’s important to note that benthic cyanobacterial mats in rivers may remain clumped together after they have detached from the bottom, but they are usually not stringy when a stick test is applied.
38. The gloved hand test also takes advantage of the filamentous structure of harmless green algae. Green algae tends to roll into a clump when it is rubbed in a circular motion, while cyanobacteria will smear or break apart, as shown in the pictures on the bottom left. Here is a short video demonstrating this test. As always, thank you to our Region 6 FHAB Coordinator, Sabrina Rice, for making these videos. While this shows the gloved hand test in lakes, benthic mats in rivers look like they’ll stick together, but they will also fall apart when this test is conducted.
39. The jar test takes advantage of cyanobacteria’s ability to regulate buoyancy. As noted here on the slide, this test is more appropriate for planktonic or floating blooms rather than benthic mats. If a sample is left undisturbed for several minutes, green algae will typically settle towards the bottom while any cyanobacteria will float to the surface. It’s important to note that a sample can contain both green algae and cyanobacteria, and some cyanobacteria may not be as responsive as others.
40. Once you have visually identified a bloom, then conducted field tests to confirm that it is potentially toxic cyanobacteria, the next step is to report the bloom.
41. Bloom reports can be submitted though our HABs Portal. When filling out the form, please be sure to include pertinent information so we can more easily identify bloom location and determine which partners need to be notified. State Board has streamlined the report form and included an option to attach photos, however, photos can still be emailed separately. Photos are extremely helpful because they allow us to conduct a preliminary evaluation of whether cyanobacteria are present.
42. Once a report is submitted, Water Boards staff review the report, contact the reporting party and local partners for more information, then approve to post to the Incidents Report Map. The point on the map will follow a color scheme based on posting recommendations, as seen on the right. Water Boards will update the webmap as new information and data come in. We always encourage the public and partners to check the webmap for the latest information. Users can also view reports in weekly updates that are sent out through our email list, which is also found at this link.
43. Also available is the Water Reporter app. Water Reporter is a social network for citizen scientists to share water quality data. Any photos and observations will be geo-referenced, then this information can be submitted to our HAB database for review prior to posting on the Incidents Report Map.
44. The state also tracks any reported illnesses that may be HAB-related. The Center for Disease Control and Prevention (CDC) launched the One Health Harmful Algal Bloom System or OHHABS in 2016 as a central repository for HAB-related illnesses across the country. The goal is to build a robust database that will further our understanding of HAB illnesses. When we receive a report of a HAB-related illness, the Illness Working Group, comprised of personnel from our Surface Water Ambient Monitoring Program (SWAMP), OEHHA, Public Health, and Fish & Wildlife, will evaluate the report and submit any determinations to OHHABS. Illnesses will also be reflected on our webmap and partners will be notified.
45. So now we have visually identified a bloom in the field, we have conducted field tests to confirm cyanobacteria are present, and we have either submitted a report or are responding to a report. In order to determine whether the bloom is producing cyanotoxins, we need to collect samples for analysis.
46. Here are the materials needed for sample collection. For more details, you can also always refer to the SOP, linked here. Be sure to have gloves and boots or waders for safety purposes. You always want to keep samples cool and in the dark after collection, so have a cooler with ice packs available. Bottle type is important to prevent toxin loss through adsorption, so please use either amber glass or plastic PETG bottles. And then your bottle labels, field data sheet, and a chain of custody (COC) to provide to the lab. Remember that all this paperwork can also be found of the FHAB Program Wiki page.
47. Wherever the bloom is occurring, be sure to confirm sampling site location and conditions. Generally speaking, we are targeting areas where the bloom conditions are the worst, and the recreational use is highest. Be sure to coordinate with the laboratory to determine shipping arrangements and fill out the appropriate chain of custody forms. And then label sample bottles using an acceptable convention, like the example shown here.
48. The type of sample you will collect depends on the type of bloom that is present. As illustrated in this graphic, planktonic blooms may be along the shoreline, at the water surface, lower in the vertical profile, or diffuse throughout the water column. Benthic blooms grow attached to the bottom as mats, but these mats can float to the water surface once they have detached. I will go over each of these sample collection types in the following slides. Note that surface scum samples are always recommended if scums are present since this is where the bloom is most dense and therefore poses the highest health risk.
49. Surface water grab samples capture blooms on the water surface and in the water column. Surface water grabs are collected separately from surface scum samples since they also target material below the surface. These samples can be collected by hand or by using a pole sampler if sampling from a structure. Here is Sabrina again demonstrating a surface water grab.
50. And here we have the surface scum sample. Again, this type of sample is highly recommended since it represents the highest potential health risk, and this sample is also collected separately from surface water grabs. Note that if surface scum is extremely dense, mixing may be required. If the surface scum is not extremely dense, you will forego the mixing and just skim the water surface.
51. Algal mat samples target benthic cyanobacteria. As we’ll discuss in later slides, most toxins for benthic cyanobacteria are within the mat material itself rather than the surrounding water, so algal mat samples are more appropriate in this situation. A composite sample is recommended by subsampling several mats of concern that represent the bloom (around 5-10 pieces); this provides an idea of average toxicity but may dilute mats that have extremely high toxin loads. We do not have a video for this one yet, so please refer to the SOP for detailed instructions.
52. Depth integrated samples are rare and generally geared towards planktonic blooms, however, I threw the slide in here anyways. As listed here, these type of samples require special equipment and characterize blooms at varying depths.
53. Solid Phase Adsorption Toxin Tracking, or SPATT samplers. These type of samplers capture cyanotoxins over time as water flows over a mesh bag filled with adsorptive resin. SPATTs are very handy in that they are sensitive enough to capture and accumulate low concentrations of dissolved toxins that are released from cells or mats into the surrounding column. Over time, these samplers can characterize benthic cyanobacteria that are occurring upstream. SPATTs are easy to deploy and relatively low cost when compared to repeated benthic mat sampling. It is important to note that they are not applicable to recommended trigger levels because they do not measure toxin concentrations per unit volume. In a recent report for North Coast rivers, we recommend a 4-8 day deployment to characterize upstream conditions, and to target anatoxins with HP20 resin.
54. Moving into the paperwork that accompanies field sampling. Field data sheets are important for documenting information on how sampling was conducted and what field conditions were present. We are always very busy and juggling a lot of projects at once, so it is always good to write down where you were, what you were doing, and what you saw.
55. Chain of Custody, or (COC), is a critical document. COCs are the communication from the sampler that is then sent to the laboratory along with your samples. It includes information on how the sample was collected, the type of analysis needed, and keeps track of sample collection times. It is always a good idea to keep a copy of the COC, whether saved electronically or by taking a picture. We have COC templates available for use, as you’ll find on your bookmarked FHAB Wiki Page.
56. Sample handling and shipping. As mentioned previously, you always want to keep samples cool and in the dark. We recommended using ice packs to avoid leaks, and amber bottles if you have them. When shipping, make sure glass bottles are secured, ice packs are plenty, the COC is included, and the cooler is secure so it won’t spill contents. You are almost always going to ship overnight so samples remain cold and within their holding times. Do not ship coolers so they arrive on weekends or holidays. And if you want your cooler returned, be sure to include a return shipping label.
57. When shipping, please notify the lab so they are aware of incoming samples. As a courtesy, we generally include a copy or picture of the COC as well as the shipment tracking number. Please CC myself as well as our State Board CyanoHAB inbox. An example email is shown here.
58. Finally, once samples reach the lab, there are several analyses for characterizing the bloom. Microscopy identifies which type of cyanobacteria are present and can provide cell density measure by enumerating cells. qPCR determines whether cyanobacteria contain the genes needed for cyanotoxin production. ELISA, which is most commonly used toxin analysis, determines what cyanotoxins are present and in what concentrations; these results can be compared to recommended threshold levels, which we will discuss shortly. Laboratory analysis for emergency response generally follows a tiered approach that may incorporate all three of these analyses. Water Boards will be happy to help you choose the requested analyses on your COC based on your situation, so please don’t hesitate to reach out.
59. You have collected samples for laboratory analysis, and now you have received your sample results. The next step is to compare these results to recommended trigger levels to determine potential health risks, then post the appropriate signs at the waterbody.
60. Before we jump into our recommended trigger levels, let’s review planktonic and benthic blooms so we can put health risks into context. I’m not going to go through each line here, but the important take-away is planktonic blooms produce toxins that are dispersed in the water and therefore there are trigger levels that correspond with the incidental consumption of water, hence the toxin concentration per unit volume. For benthic blooms, the cyanotoxin load is within the mat material, which becomes a health risk when they detach and accumulate; in other words, the health risk is the incidental consumption of mat material. Currently, there are no trigger levels applicable to mat material, which would be expressed as a solid or ug/g.
61. Here is our three-tiered system of trigger levels for planktonic blooms, not benthic mats. These voluntary guidelines were developed in 2016 by the California Cyanobacterial Harmful Algal Bloom Network (CCHAB), which includes the State and Regional Water Boards, as well as OEHHA. It is difficult to see on the right, but there is a flowchart available to illustrate the process of using trigger levels and posting signs either at the Caution, Warning, or Danger level. This guidance is voluntary and is designed for posting signs at waterbodies to protect the public and animals from planktonic blooms during recreation. As you can see in the table, we have three cyanotoxins as our primary indicators (microcystins, anatoxin-a, cylindrospermopsin), and cell density or visual evidence as secondary indicators.
62. Here are the various signs that were developed for planktonic blooms based on the three trigger levels. You’ll note that the CAUTION signs allow for water recreation for people and children but recommends staying away from visible blooms. CAUTION also recommends keeping dogs away, not drinking the water, and not consuming shellfish. Boating is still allowed under a WARNING, but all water recreation is discouraged under a DANGER. Fishing and fish consumption should be safe under a CAUTION or WARNING, however, it is recommended to rinse with clean water, only consume fillets, and toss guts and fatty tissues. Remember, the primary exposure for planktonic blooms is the incidental ingestion of water, and dogs and children are most at risk.
63. Also available are “general awareness” signs for planktonic blooms that were developed by the USEPA. These can be posted any time of the year to educate the public about planktonic HABs. It’s important to note that these should not replace advisory signs that correspond to the recommended trigger levels.
64. Moving on to benthic cyanobacterial blooms. Benthic mats grow attached to the bottom of a waterbody, then detach either through disturbance or natural senescence. Once detached, mats will float on the water surface to downstream areas. Of particular concern is when mats accumulate and become stranded, especially at areas that are frequented by people and pets. Remember, the primary exposure route for benthic cyanobacteria is the incidental ingestion of mat material. Again, pets and children are most at risk.
65. Here are two videos showing the process that I just described. In this first video, Rich is disturbing the bottom substrate of a stream, and benthic mat material begins to float to the surface. You can see at the tail end of the video that benthic mats are already accumulating. In the next video, benthic mats are jumping off this riffle and accumulating in a low flow area; this is obviously a concern if this area is used by people or pets for water recreation.
66. Here are the signs we have available for benthic cyanobacteria. Similar to planktonic blooms, we have a general awareness or “Check for Algae” sign that is designed to educate the public on what to look for and how to recreate safely. “Toxic Algae Alert” signs are recommended once mats of toxin-producing cyanobacteria are identified either through visual observation, microscopy, or cyanotoxin analysis. Again, we have voluntary guidance that walks you through this process, as illustrated by the flowchart on the right. It’s important to note that the North Coast Water Board is currently conducting a special study to incorporate SPATTs and other monitoring recommendations into this posting process; the CCHAB Network will be evaluating these study results to potentially revise current guidelines. I’ll discuss these studies in greater detail in the next section.
67. Alright, so we have walked through the steps for HAB monitoring. Next, we will go over the North Coast Region’s benthic monitoring recommendations for rivers, since these type of blooms are a more novel and pressing issue in our region.
68. In response to several dog deaths, the North Coast Region conducted an extensive study from 2016-2019 in the Eel, South Fork Eel, and Russians Rivers, as shown in the map on the right. This study documented benthic cyanobacteria and cyanotoxins of concern, evaluated different sampling and analytical techniques, and ultimately provided monitoring recommendations for successful benthic HAB monitoring programs. You can find a link to this report and the CCHAB presentation here.
69. Benthic monitoring recommendations that came out of the report follow a tiered approach: 1) use SPATTs as sentinel samplers to determine when cyanotoxins are increasing and moving through the river system; 2) once SPATTs indicate that cyanotoxins are increasing, implement visual monitoring to document location, extent, and condition of toxic mats; and 3) if mats are abundant, detaching, and accumulating, conduct mat sampling to confirm toxicity. The report identifies three mat-forming genera that pose the greatest health risks; these are Anabaena, Microcoleus (Phormidium), and Oscillatoria, which I remember by the acronym AMO. We are encouraging our partners to keep an eye out for these three genera as well as implement the 3-tiered approach for their HAB monitoring programs.
70. In 2022, the North Coast Region conducted a pilot study by collecting data for all three tiers throughout the bloom season. This graph shows anatoxins concentrations in SPATTs (solid line), benthic mats (dashed line), and cyanobacteria percent cover (dotted line) over time. At this particular site SPATTs signaled an increase in anatoxin concentrations about 1-2 weeks prior to increases in cyanobacterial mats. These increases occurred prior and at a faster rate than increases in cyanobacteria percent cover on the river bottom. What these results suggest is that SPATTs can provide some early indication of benthic blooms. Additionally, all three data types may provide some indication of when public health postings are appropriate. The Water Boards is currently conducting a similar project this year to evaluate and implement the tiered approach; these results will be shared with the CCHAB Benthic Subcommittee to consider when potentially revising benthic guidelines, so stay tuned.
71. Finally, I’ll provide a quick review of the program resources we have available.
72. Most of you are familiar with the California HABs Portal, which provides information to the general public as well as our partners. There is a wealth of information on the portal, but I have highlighted some topics of interest here.
73. And one last final reminder about the FHAB Program Wiki page.
74. The Water Boards can provide sampling kits and signs for posting, however, these resources are limited and usually reserved for emergency or incident response, which I’ll discuss more on the next slide. We are encouraging our partners to purchase their own sampling bottles or print signs when they are able. Signs can be printed using our templates online, but we do have signs that can be shipped, so just let us know. We will also be reaching out when additional signs are being produced and distributed.
75. Emergency incident response funding is always set aside for the Water Boards to provide for sampling, shipping, and laboratory analysis, so please let us know whenever you suspect a bloom and need assistance. In order to use these funds appropriately, the Water Boards is following a prioritization scheme. Waterbodies with a reported illness, or those that are publicly accessible with recreational use will be prioritized. Additional evidence from satellite imagery or photos is also helpful.
76. And lastly, notifying the public of potential health risks is our top priority. The Water Boards has templates available for both “press releases” and “news advisories.” Press releases can require review from Public Information Officers, and if done jointly with local partners, can take additional time due to that extra level of review. Overall, press releases may take 5 business days or more, which if time permits, may be a good option, especially if it is a coordinated joint release. However, another option is “news advisories.” These pre-approved templates can be ready for release in 2-3 days, but these will only be from one agency since separate releases are needed for faster publishing. Another mechanism to get the word out is Twitter. Water Boards can tweet about local partner press releases when posted, further spreading any notifications.
77. That concludes our material for today’s training, so I’ll go ahead and share our contact information. Please do not hesitate to contact myself or any of the above – we are here to assist you as you develop your FHAB monitoring and response programs.
78. And now we’ll move into our questions and answers period.
79. Thank you all for your time and attention. If you are able, please use the raise hand feature so we can get to everyone’s questions in an orderly fashion. Once you unmute yourself, please state your name and affiliation before asking your question. Also, if you haven’t done so already, please enter your name and affiliation in the chat box so we know which partners participated in today’s training. Thanks again!