5. Strategies for Communication and Response Planning for HCBs

As water body managers observe and monitor their water bodies for HCBs, it is important to consider how that information will be conveyed to the public and incorporated into broader actions at a local, state, and regional level to respond to and communicate about HCBs and potential HCB-related illnesses. A unified approach helps protect the public from risks associated with exposure to cyanobacteria and the toxins they produce (cyanotoxins), as described in Section 3. A strategic communication and response plan coordinates internal and external communication and response actions between agencies and entities, including the water body manager and the public, before, during, and after bloom events. The entities responsible for response actions and communication should be identified prior to HCB events, if possible. Many of these actions will depend on coordination between internal state agencies, such as health, environment, agriculture, and state parks departments, and external partners, such as local health authorities, recreation authorities, water utilities, and lake associations. In some states, a single lead agency is designated to coordinate the investigation, response, and communication. A regional, multistate approach would be applicable for water bodies that extend across multiple states, such as the *Upper Mississippi River Harmful Algal Bloom Response Resource Manual* (UMRBA 2020). Interstate or even international partners may also be needed for affected water bodies that span multiple state or national jurisdictions.

To assist users at different points in the HCB response process, this Section is organized with the key response and communication tasks listed by two time frames: an immediate communication and monitoring response before or during a bloom, and longer term efforts to build and maintain a response program beyond the immediate bloom season. Much of this information is applicable to recreational water bodies and source water sources; aspects specific to only recreational waters, source water sources, or drinking water utilities are identified. Table 5-1 summarizes these key topics and how the tasks for each are organized into the two time frames. The table includes key federal and state examples by topic as well. Please note: Not all topics will be applicable to each specific event or program. A similar table in HCB-2 provides communication and response planning resources applicable for benthic cyanobacteria as well.

Table 5-1. Summary of key HCB communication and response topics and tasks organized into two time frames: immediate actions before or during an HCB and longer-term planning and continued collaboration beyond the immediate bloom season

Key Topics	**Immediate Communication and Response Tasks** **Section 5.1**	**Build, Improve, and Maintain Response Capacity** **Section 5.2**	**Examples and Resources [1]**
Reporting, Notification, and Coordination	Establish mechanism(s) to report blooms and illnesses	Continue periodic coordination calls Identify funding needs and potential opportunities Update contacts Organize meetings and workshops Establish agreements and funding mechanisms	Arizona Water Watch Mobile App New Jersey Department of Environmental Protection's WARN NJDEP app New York State Department of Environmental Conservation HABs Notifications Page bloomWatch USEPA's list of health and environmental agencies by state or territory USEPA's state HABs resources web page USEPA fact sheet on funding sources for managing cyanobacterial harmful algal blooms and cyanotoxins in drinking water (USEPA 2017a)

Visual Observations	Get photos Compare photos to Visual Guide	See Section 4 for additional details	California's *Surface Water Ambient Monitoring Program Visual Guide to Observing Blooms* USEPA's list of state HABs monitoring programs and resources USGS' *Field and Laboratory Guide to Freshwater Cyanobacteria Harmful Algal Blooms for Native American and Alaska Native Communities* (Rosen and St. Amand 2015) National Centers for Coastal Ocean Science's Phytoplankton Monitoring Network Freshwater Plankton Image Gallery cyanoScope's algae guide on visual signs of a cyanobacterial bloom
Remote Sensing	Use readily available tools and communicate applicable issues	Explore additional resources available	USEPA's CyAN app Sentinel Hub's Sentinel Playground
Field Sampling	Conduct initial site visit and collect samples Conduct follow-up monitoring until bloom dissipates	Prepare and stage sampling supplies Evaluate sampling protocol Train staff on sampling	Section 4 of this document USGS' *Guidelines for Design and Sampling for Cyanobacterial Toxin and Taste-and-Odor Studies in Lakes and Reservoirs* (Graham et al. 2008) USGS' *Field and Laboratory Guide to Freshwater Cyanobacteria Harmful Algal Blooms for Native American and Alaska Native Communities* (Rosen and St. Amand 2015) Cyanos.org's Cyanobacteria Monitoring Collaborative USEPA's tools for water body managers to monitor for and respond to cyanoHABs
Laboratory Analysis	Identify labs Coordinate sample receipt and timing of results	Identify additional laboratories and contracting needs, both contract and internal laboratory Establish and update analytical contracts	USEPA's list of laboratories that analyze for cyanobacteria and cyanotoxins
Drinking Water Coordination and Planning	Identify potentially impacted source water and intakes Identify potential alternative supplies and treatment options	Develop and maintain an emergency response plan	USEPA's cyanotoxin management tools for PWSs

Advisories and Outreach	Identify thresholds Post advisories Communicate results Lift advisories when criteria are reached	Appendix B of this document Evaluate and improve outreach, particularly through social media Build list of common questions and responses (FAQs) Review updated resources Update outreach materials and webpages Conduct surveys	Utah Department of Environmental Quality's HABs web page Idaho Department of Environmental Quality's HCB advisory web page CDC's cyanobacteria blooms FAQs USEPA's drinking water health advisories for cyanotoxins USEPA's Drinking Water Cyanotoxin Risk Communication Toolbox USEPA's recreational water quality criteria and methods USEPA's templates and generic examples for communicating about cyanobacterial blooms and toxins in recreational waters
HCB-related Illness	Collect information and conduct interviews	Coordinate with the poison control center and the appropriate state or local health departments Evaluate information Draft reports Summarize illness information Finalize and submit reports	USEPA's health effects from cyanotoxins web page CDC's OHHABS
Data Management and Mapping		Develop an interactive map for HCB information Establish a database to house information Identify long-term storage options	California HABs Portal Washington State Toxic Algae website Utah Department of Environmental Quality's Harmful Algal Blooms web page Ohio Environmental Protection Agency's PWS HAB monitoring map

[1] Full webpage links are provided in the subsequent Sections where these topics are described.

These tasks may also be displayed graphically as a flow chart and incorporated into the response plan. Recreational water examples from New Jersey and Idaho HAB response plans are included below (see Figures 5-1 and 5-2), and USEPA has a four-step flow chart for water managers for recreational waters (USEPA 2019e). USEPA also provides a five-step flow chart for potential cyanotoxin management steps for PWSs (USEPA 2015h).

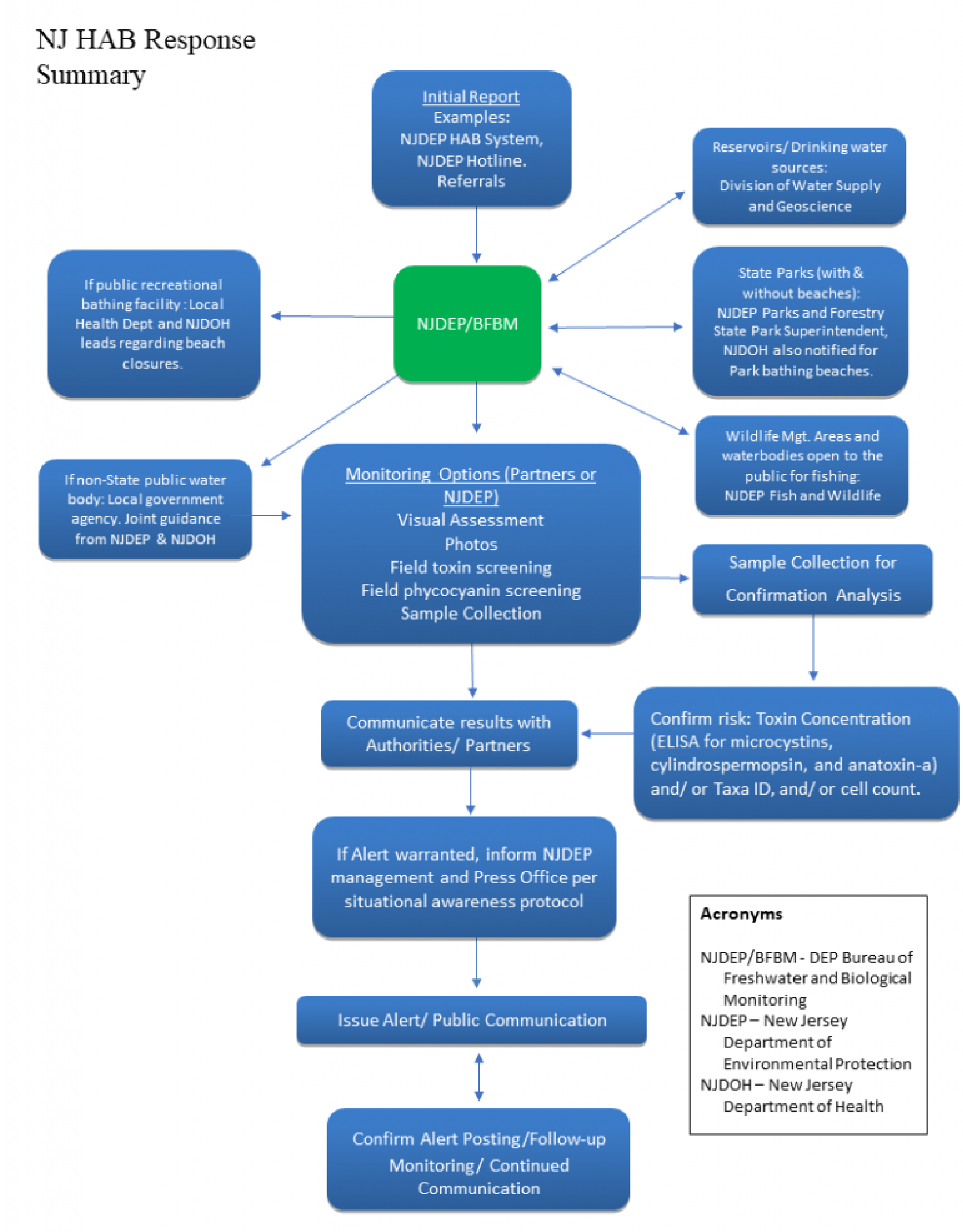

Figure 5-1. New Jersey Department of Environmental Protection HCB response flow chart.
Source: New Jersey Department of Environmental Protection. Used with permission.

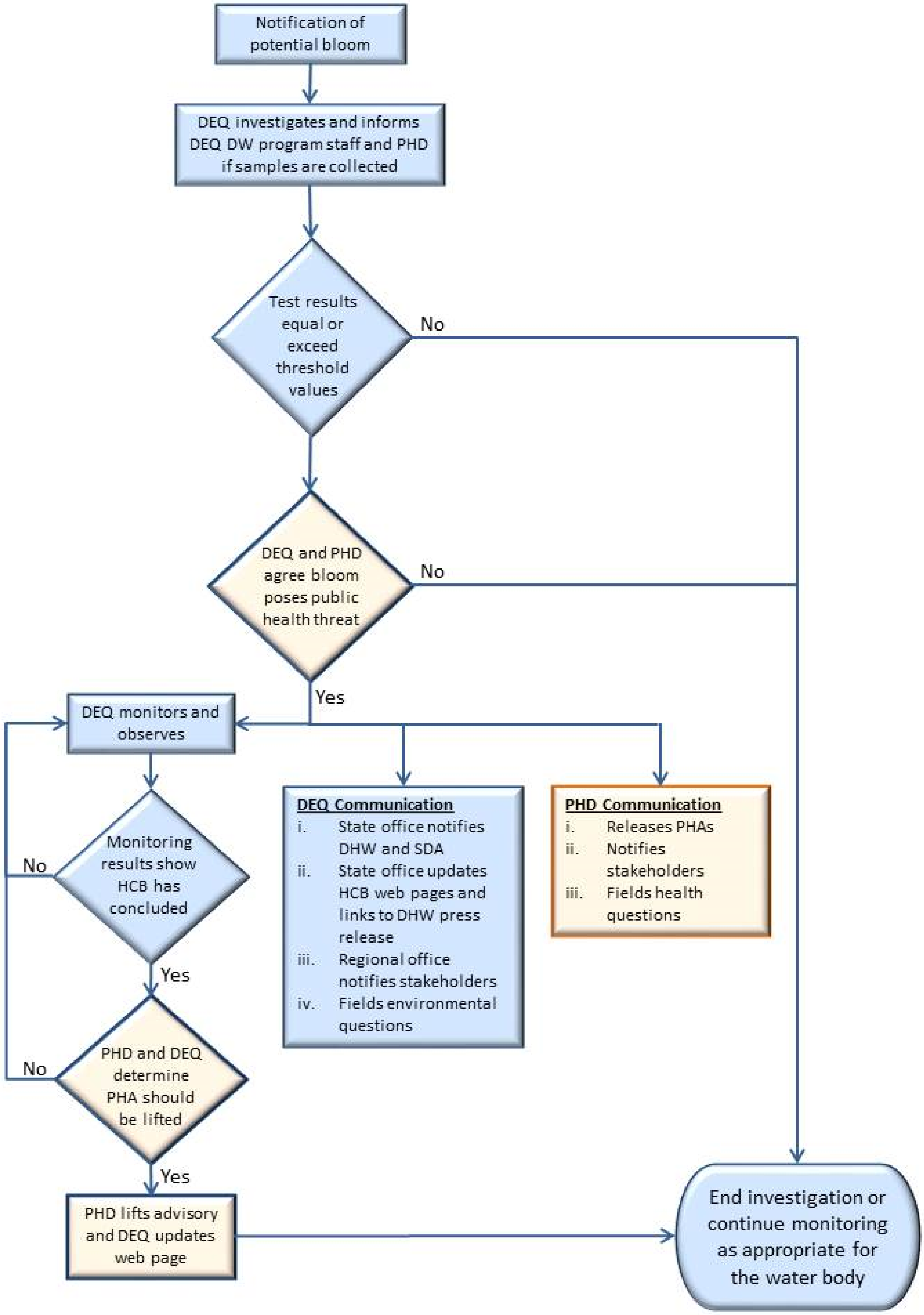

Figure 5-2. Idaho Department of Environmental Quality HCB response flow chart.

Source: Idaho Department of Environmental Quality. Used with permission.

For more general (non-HCB-specific) resources for risk communication, see the ITRC Risk Communication Toolkit (ITRC 2020), which includes a brief overview of risk communication concepts, suggested steps for developing a communication plan, state case studies, and other supporting tools.

5.1 Immediate Communication and Response Tasks

Risk communication provides the public, stakeholders, and agency decision-makers with the scientific, health, and environmental information they need to make informed decisions about the potential health risks from exposure to HCBs. Although the primary focus is on the protection of human health, communication should include information to prevent exposure to domestic animals (pets and livestock) and wildlife. Timely communication is an essential part of the initial bloom response, especially as additional information about the extent and toxicity of the bloom becomes available. Proactive communication also builds agency trust and credibility during bloom events. Response activities support and inform communication efforts and are an integral part of community outreach during a bloom event. As is noted in Table 5-1 and in more detail in the following Sections, immediate HCB communication and response tasks generally include the following:

- reporting, notification, and coordination
- HCB confirmation:
    - visual observation
    - remote sensing
    - field sampling
    - laboratory analysis
- drinking water sources and coordination with drinking water utilities
- health advisories
- HCB-related illness collection and reporting

5.1.1 Reporting, Notification, and Coordination with Key Partners, Stakeholders, and the Public

It is critical that the responsible entity establish mechanisms for receiving reports of a possible HCB and notifying the appropriate parties after receiving reports. Initial reports of potential HCBs and potential HCB-related illnesses may be received from a variety of sources, including members of the public, other agencies, and doctors or veterinarians, and through a variety of mechanisms, including centralized reporting systems, email, or social media. Some states use a single mechanism for multiple environmental incidents, including HCBs. Examples include the Arizona Water Watch App and New Jersey's WARN NJDEP App. Other states use HCB-specific reporting mechanisms. Examples include New York and California. States may also establish processes to receive bloom reports submitted through smartphone apps, such as bloomWatch.

Regardless of the reporting system used, timely notification of key partner agencies or entities is critical. Partners may include state environmental agencies, Native American tribes, state and local health departments, municipalities, lake associations, natural resource agencies, state and private parks, PWSs, and poison control centers. Interstate or even international partners may also be needed for affected water bodies that span multiple state or national jurisdictions. HCB notification systems often designate a lead agency to be responsible for collecting and merging incident reports, contacting partners, and providing regular updates. Notification of potential downstream or adjacent impacts is also crucial for nearby recreation, drinking water intakes, utilities, and individuals with livestock or private wells. The notification area for HCB events is water-body-specific and ideally would be discussed in advance.

If a suspected HCB is reported for a water body that is a drinking water source, the responsible state agency or entity should work closely with the affected drinking water utilities and regulatory agencies. States should work with drinking water providers to identify the downstream drinking water intakes that would be affected by an upstream HCB. Drinking water utilities may also detect the HCB first, such as with taste and odor events, and can notify upstream water users as well. See Section 5.1.3 for additional details on source water response and coordination with drinking water utilities.

Ideally, coordination between partners occurs prior to bloom events. If not, it is important to set up a mechanism to coordinate response and communication as soon as possible after a bloom is reported. Regularly scheduled conference calls, group emails, and in-person meetings ensure that the concerns and needs of multiple entities regarding bloom response and communication are addressed quickly and effectively. Communication and coordination between key partners can include designation of a spokesperson to respond to media inquiries, communication templates to ensure consistent messaging, and joint press releases (see Section 5.2.5).

It is important to notify the public as well about a potentially toxic bloom as soon as possible. This communication should tell them what is known, what is unknown, and when they can expect to receive updates. Notification and coordination with stakeholders, such as veterinarians and medical professionals, community scientists, or watershed groups, is also important. Effective communication educates people about HCBs, informs them of possible health risks, and identifies steps they can take to reduce their exposure. General information inquiries can be referred to a dedicated website or other digital platforms to ensure clear, consistent messaging. Frequent updates to websites help members of the public and the media access the latest information quickly. These sites can also provide basic information about HCBs and answers to frequently asked questions that people can reference as needed. See Section 5.2.5.1 and Appendix B regarding a recent survey on notification preferences by age group and location.

5.1.2 Bloom Identification

Once a potential bloom is reported, initial responses to verify whether the event is an HCB include reviewing photographs of the suspected bloom, collecting information about the water body using surveys or other standardized forms, and checking remote sensing data. After assessing this initial information, the lead agency and partners can evaluate the need for site visits, field tests, sampling, and laboratory analysis. More detailed evaluation of HCB monitoring methods is included in the Section 4.

5.1.2.1 Visual Observations

Depending on the species of cyanobacteria involved, visual observations and photos of water body conditions collected by members of the public, local health departments, or citizen science groups can support and benefit HCB response programs and water body managers. See Section 4.3.1.1 for comparison to other monitoring methods. If possible, request photos of the suspected bloom or preestablished monitoring location. If the HCB involves a cyanobacteria that accumulates near the water surface, images can help determine whether the bloom might be cyanobacteria, as well as the extent of a bloom in the water body. Sometimes cyanobacteria blooms can be confused with pollen, duckweed, or filamentous algae. Examples of these surface phenomena are shared in several resources:

- *ITRC's* Visual Guide to Common Harmful Cyanobacteria
- cyanoScope's visual guide
- National Centers for Coastal Ocean Science's Phytoplankton Monitoring Network Freshwater Plankton Image Gallery
- USGS' *Field and Laboratory Guide to Freshwater Cyanobacteria Harmful Algal Blooms for Native American and Alaska Native Communities* (Rosen and St. Amand 2015)
- Vermont Department of Health's visual guide

Geographical information, including coordinates or cross-streets, should also be provided to facilitate repeat observations at the same location. In addition to their use in response to a reported bloom, photos of HCBs from different water body types or regions can be used to develop outreach materials to help the public recognize HCBs and in training materials for volunteer monitoring groups (see Section 5.2.7).

In addition to site photos, microscopy samples can be collected and used for cyanobacteria identification, either in the field using microscope kits equipped with a digital camera or at a laboratory (see Section 4.3.1.5). These images can be used for screening purposes and to help determine next steps. See the ITRC Visual Guide to Common Harmful Cyanobacteria and other existing tools (Rosen and St. Amand 2015) for aid in confirmation. If HCB images are not easily interpretable, they can be sent to the applicable state staff (if identified), external HCB taxonomists (which may require a contract), or crowdsourced identification groups such as the Cyanobacteria Monitoring Collaborative. With external personnel and groups, it is always best practice to contact groups concerning availability and capacity prior to submitting imagery.

5.1.2.2 Remote Sensing

Remote sensing imagery is a useful approach for temporal and spatial monitoring of water bodies because it allows coverage of broader areas of interest without the need to be on site. Remote sensing is generally used as a screening tool, to estimate status and trends of HCB events, and to inform deployment of staff and other actions, but it is usually not used for quantitative data or as the only basis for advisories. Remote sensing is used more quantitatively, for example, in the Lake Erie HAB Forecast.

Currently, there are two free desktop and mobile platforms that allow users to directly access satellite data for cyanobacteria monitoring: USEPA's CyAN project and Sentinel Hub's Sentinel Playground. A general review of satellite technology and capabilities related to water quality is available in IOCCG (2018) and in Section 4.3.1.4.

Communication regarding the current use of remote sensing in detecting HCBs should address limitations and potential impacts, such as cloud cover and wildfire smoke, applicability to open water areas only, constraints on water body size depending on the pixels for the technology being used, and the time frame for which remotely sensed images are available. For example, the California HABs Portal uses the following language with its Satellite CyanoHAB Map:

"*This map displays estimated amounts of cyanobacteria in large water bodies calculated from satellite imagery. The map includes approximately 250 waterbodies in California large enough to be detected by the satellite. It is designed as a screening level analysis tool. For example, if the satellite shows a potential bloom, this can prompt field verification and* *sampling to confirm the status of a potential cyanobacteria harmful algal bloom. Decisions for health advisory postings will be made based on results from water quality samples. No regulatory decisions, or signage postings, should occur based solely on information from the map."*

5.1.2.3 Field Sampling

If preliminary investigations indicate the need to gather additional information, the lead entity should coordinate with partners to conduct a site visit, perform field screening (for example, strip test or field fluorometer), and collect samples of the suspected HCB as appropriate. Staff and partners should be adequately trained in field methods and health and safety and be provided with necessary equipment and supplies. For guidance on monitoring plan designs, see Section 4.5, Graham et al. (2008), and online field sampling resources such as the *California Freshwater Harmful Algal Bloom Field Guide* and USEPA Region 9's field sampling procedures.

A good sampling protocol for HCBs should consider:

- Appropriate analyte or indicators:
    - Analytes or indicators should be identified that would be most useful in (1) determining whether a harmful bloom is present and (2) if the bloom could be evaluated against guidance thresholds established by the state.
    - Standardized, scientifically recognized, or certified methods should be used and will require specific sampling protocols, holding times, and sample preservation.
- Methods based on type of water body and cyanobacteria:
    - The type of water body (such as lake, river, or pond) that flows into or out of the area of concern and the type of cyanobacteria (planktonic or benthic) may impact the ability to detect the HCB. Identifying and monitoring benthic cyanobacteria species require different protocols than those used to sample the planktonic species found on the surface water and in the water column.
- Locations:
    - Consider possible sampling to assess downstream impacts, such as to a drinking water source or livestock. Sampling near drinking water intakes may require different sample protocols. See Section 5.2.3 on emergency plans for drinking water.
    - Prioritize initial sampling that will provide results most protective of public health, such as beaches, boat launches, or the most concentrated area(s) of the bloom.
    - Use continued monitoring to characterize the bloom event throughout the water body, including across the surface and at depth. HCBs can occur at different depths and in different areas of a water body, and the spatial extent can change during the course of a bloom event. Assessing and preparing for these differing conditions by prepping for different sampling depths can ensure success for monitoring the continued status of a bloom.
- Frequency:
    - After the initial HCB sampling event, entities overseeing response actions should determine continued monitoring activities and time frames. If a health advisory is issued, sampling crews should follow the protocol outlined in the advisory (such as weekly or when a surface bloom has visually dissipated). Sampling should occur frequently enough to provide relevant data for the continuation, status change, or lifting of the advisory, but not too frequently. Daily sampling for recreational waters, for example, may not change the advisory status, but it may adversely affect response staff resources and increase costs. Drinking water impacts may warrant more frequent evaluation.
    - Changes in wind or flow may affect HCB accumulations and may warrant resampling to evaluate subsequent change in cyanobacteria abundance or cyanotoxin concentrations.
- Safety:
    - Determine the personal protective equipment (PPE) that is needed to provide the appropriate level of protection for sampling personnel and assume the water contains cyanobacteria and cyanotoxins until proven otherwise. At a minimum, samplers should wear waterproof boots, long pants, gloves, and eye protection. Actions to minimize aerosols, such as boat speed or direction, or limit exposure to them should also be considered.
    - Descriptions of the symptoms an individual may exhibit after exposure to cyanobacteria or a cyanotoxin can help protect samplers. Information on health risks is available on a number of websites, including USEPA's Health Effects from Cyanotoxins web page.

5.1.2.4 Laboratory Analysis

When selecting a lab, agencies may wish to review USEPA's list of laboratories that analyze for cyanobacteria and cyanotoxins, which lists laboratory capabilities and their ability to analyze parameters of interest within the thresholds established for advisories. It is important to work with the laboratory to confirm handling techniques, preservative use (if any), desired analysis, and an agreed-upon time frame for receiving test results. Remember to consider time needed to prepare for communicating with the public when estimating a time frame for receiving test results.

5.1.3 Drinking Water Sources and Coordination with Drinking Water Utilities

Coordination among water body managers, response agencies, and water suppliers is vital to ensure that PWSs are prepared to manage and treat their source water appropriately and immediately if HCBs occurs. If at all possible, this coordination should happen prior to a bloom and be incorporated into a cyanotoxin management plan or other emergency response document that addresses actions necessary to address HCBs and cyanotoxins.

Drinking water utilities should consider the following resources when developing a cyanotoxin management plan or emergency HCB response plan:

- USEPA has compiled cyanotoxin management tools for PWSs. Resources include a cyanotoxin management plan template, a document on effective drinking water treatment approaches, methods for monitoring and sampling raw and finished water, and a Drinking Water Cyanotoxin Risk Communication Toolbox.
- CDC's Drinking Water Advisory Communication Toolbox provides useful tools and templates to communicate with partners and the public about drinking water advisories resulting from various causes.
- AWWA has also created documents that address frequently asked questions regarding HCBs and cyanotoxins.
- The Association of State Drinking Water Administrators has compiled a list of resources that address issues surrounding drinking water and HCBs.
- The Utah Department of Environmental Quality also has a basic cyanotoxin management plan template that can also help water systems get started with plan development.

5.1.4 Determine Thresholds for HCB Advisories for Recreational and Drinking Water

Public health and environmental agencies should identify state, water body, or regional advisory guidance thresholds for cyanobacteria and cyanotoxins in drinking water sources and recreational water bodies and the process for issuing an advisory, ideally before blooms occur. If guidance thresholds are not currently in place, local managers and state agencies can refer to existing federal and state criteria.

Scientists have researched cyanobacteria and cyanotoxins for several decades, but overall understanding of the health-related impact of these cyanobacteria and cyanotoxins to the human environment has advanced rapidly since 2000, and new, important findings are announced on a regular basis. Currently, most research has focused on a single cyanotoxin (microcystin) and, more specifically, on a subset of microcystin congeners (there are more than 200 known variations, or congeners, of the microcystin molecule). USEPA issued guidance values for microcystins and cylindrospermopsin in its 2015 Drinking Water Health Advisories for microcystin (USEPA 2015d) and cylindrospermopsin (USEPA 2015c) and its 2019 *Recommended Human Health Recreational Ambient Water Quality Criteria or Swimming Advisories for Microcystins and Cylindrospermopsin* (USEPA 2019e). States and response program managers may choose to adopt the USEPA guidance, adopt threshold values from other states, or evaluate the available scientific literature as the starting point for developing their own threshold values.

The body of knowledge into the toxicity of the other cyanotoxins (anatoxin-a, saxitoxin, nodularin, BMAA, and others) is not as extensive as for microcystins and cylindrospermopsin. Only a few states have developed threshold values for these other cyanotoxins. Individual states or jurisdictions may want to review guidance developed by other states for these cyanotoxins as available or conduct additional literature review to identify appropriate threshold values. Section 2.6 of HCB-2 has summary tables and maps for recreational and drinking water thresholds for the four main cyanotoxin classes

Other options include adoption of visual criteria for further investigation or beach closure, such as New York's advisory criteria for suspicious blooms (NYDEC 2019), or cyanobacterial cell counts, such as those used in Idaho (IDHW 2017), Massachusetts, and Utah.

Although most guidance values are for cyanotoxins in water or bloom material, some guidance values for human health are available for fish and shellfish tissue concentrations. The U.S. Food and Drug Administration (FDA) has a criterion of ≥ 0.8 mg/kg saxitoxin equivalent in fish and shellfish tissue (FDA 2020). OEHHA (2012) has thresholds for three cyanotoxins (microcystins, cylindrospermopsin, and anatoxin-a) for recreational fish and shellfish consumption. In addition, precautions regarding fish and shellfish consumption may be incorporated based on water concentrations as noted below.

5.1.5 Post Advisories and Communicate Results

If possible, templates for advisory signs for recreational advisories and public and media notifications should be developed well in advance of HCBs.

Useful examples of HCB advisories and communication are available from:

- Recreational water:
  - Utah Department of Environmental Quality's HAB web page and health advisory flow chart
  - Oklahoma State Department of Health's blue-green algae fact sheet
  - Idaho Department of Environmental Quality's recreation water quality health advisories
  - Oregon Health Authority's current cyanobacteria advisories web page
  - USEPA's template and example advisory notices for recreational water
- Drinking water:
  - USEPA's Drinking Water Cyanotoxin Risk Communication Toolbox with templates and advisories for drinking water
  - CDC's Drinking Water Advisory Communication Toolbox with templates of how, what, and when to communicate with stakeholders

If there is suspicion that HCBs are present upstream from or within a drinking water source water body, drinking water utilities should be contacted so they can test for cyanotoxins in incoming raw water. The utilities may then be required to alert consumers about the possible or confirmed presence of HCBs in incoming water, depending on state (or primacy agency) Safe Drinking Water Act requirements.

When HCBs are confirmed above the applicable guidance thresholds, communicate with partners as soon as possible to post necessary advisories or beach closures. State and local entities should consider the following steps when issuing a health advisory:

- Define the area(s) of the water body where advisories apply, such as the entire water body or specific coves and beaches. This may be particularly important in large lakes with multiple beaches and uses. If only part of a water body is under advisory, include language on signs, websites, and communication with the public explaining the need to watch for potential bloom migration from advisory areas into open areas.
- Determine whether the HCB includes benthic cyanobacteria. Benthic blooms may require specific communications regarding exposure, health risks, and recommended precautions. New Zealand has advice for health risks and communication (Wood 2017), as well as posting criteria and signage for benthic cyanobacteria. The California Cyanobacteria and Harmful Algal Bloom Network recently adopted benthic cyanobacteria (toxic algal mats) signs and posting guidelines.
- As recommended in USEPA's Good Practices when Developing Notifications for the Public, include lists of (1) unsafe activities (such as swimming, wading, or fishing); (2) approved activities (such as boating, canoeing, or kayaking) based on current conditions; and (3) activities that can be done with additional precautions, such as removing the viscera and rinsing the fish filet with clean water before freezing or cooking or reducing boat speed to minimize aerosols.
- For drinking water sources, it is also important to acknowledge that drinking water treatment can ensure safe drinking water even when recreational advisories are in place.
- Confirm that advisories, including details about where the bloom is and when it was established, have been posted or communicated using one or more tools such as physical posting, press releases, websites, social media, or robo-calls.
- Identify groups representing different types of water body users, such as lake associations, fishing groups, watershed management groups, homeowners' associations, community science groups, and others, and consider how best to notify them of the bloom (See Appendix B).
- Communicate the bloom's status through regular updates at a central location (for example, a dedicated web page) during the HCB event, including any lifting of an advisory.
- Communicate where and when new information will be available. Acknowledge unknowns, such as how long the bloom will last.
- Define the parameters required to lift an advisory. Parameters may include sampling results that show cyanobacteria or cyanotoxin levels below advisory thresholds over a predetermined period of time.
- Coordinate with other groups responsible for other types of advisories, such as *E. coli* programs. For example, the HCB may have dissipated, but the beach may still have other advisories or closures affecting the system.
- Many states translate advisories and HCB-related information into different languages to ensure the health of

safety of non-English-speaking residents. Advisory signage can be posted in multiple languages using simple icons that indicate prohibited activities. Fact sheets translated into languages commonly used by area residents can be distributed to local, non-English-speaking media outlets to help disseminate information about ongoing blooms and risks from exposure. Installation of a Google Translate button on your HCB website is an effective way to direct web visitors to translation services for 64 languages.

More related resources and options to consider when more time is available are included in the Section 5.2.5 of this guidance.

5.1.6 Evaluate and Document HCB-related Illnesses

Exposure to HCBs can lead to adverse health impacts in humans and animals. Cyanobacteria and cyanotoxins can cause dermatological, gastrointestinal, liver, kidney, or neurological symptoms that may range from mild to severe. A single state health agency or multi-agency working group should be identified to collect, investigate, and document potential HCB-related illnesses. This work involves close collaboration with staff investigating the water body where exposure occurred to evaluate the presence of cyanobacteria and cyanotoxins. States may want to establish the time frame or conditions in which designated response activities occur after they receive health incident or bloom reports. For example, sampling may not accurately capture the conditions that led to HCB-related illness if a significant amount of time has elapsed since exposure or storms have altered bloom location and density.

Coordination with the local poison control center or other centralized resource can provide up-to-date information to the public and help chart illnesses linked to specific bloom sites. Poison control centers are well equipped to centralize HCB-related health incident reports. In some states, individuals who believe they or their pets have fallen ill due to HCB exposure can be directed to the local poison control center to route their incidents to appropriate health authorities. Public health agencies conduct interviews with the person or persons reporting the bloom and other knowledgeable individuals to collect details on exposure, observations of water body conditions, and onset and duration of symptoms. Information on preexisting medical conditions, medications, and other potential diagnoses should also be gathered. Access to veterinary or medical records, when permitted, can provide key details as well.

Communication with the public about possible health risks from HCBs, as well as regular updates on confirmed human and animal HCB-related illnesses, will keep the public informed and help prevent further exposures and possible illness. Note that information shared should be communicated from public health agencies and should be de-identified and aggregated to ensure that Health Insurance Portability and Accountability Act of 1996 (HIPAA) requirements for health information privacy are met.

Many states participate in the CDC's OHHABS, a One Health surveillance system that incorporates information on environmental conditions and HCB-related illness reports in humans, pets, livestock, fish, and wildlife. Information reported to OHHABS by states and territories will help us better define patterns of occurrence, protect water and food supplies, and communicate with the public to prevent future illnesses. OHHABS also provides data collection instruments (including a health survey for people and a health survey for animals to be completed with or by the treating veterinarian) that can be printed and used in the field. OHHABS also provides case-definition criteria for cases reported as suspect, probable, or confirmed. States may use these criteria directly or adapt them for their internal tracking purposes.

5.2 Build, Improve, and Maintain Response Capacity

Long-term planning and continued collaboration beyond the immediate bloom season are critical for a successful HCB response and communication program. Post-bloom evaluation of the strengths, weaknesses, and gaps in the response and communication process strengthens HCB programs and leads to improvements during future bloom seasons. Program evaluation takes many forms, from counting clicks on a website to conducting a full evaluation with standard criteria. As part of your HCB planning, decide how you plan to evaluate the success of your activities. Planning and preparation for bloom events can take place in the off-season and build on lessons learned. If agencies do not already have a formal response and communication plan in place, this is a perfect time to work on one. If agencies already have a plan in place, the off-season is a good time for them to review their plans and adjust them as needed.

The following tasks can help agencies or entities new to bloom response take interim steps and build response capacity outside the primary bloom season. For those with existing HCB plans, these tasks can strengthen existing programs and improve communications and response capacity.

5.2.1 Explore Remote Sensing Opportunities

Agencies may want to consider which remote sensing resources, if any, might be applicable to larger water bodies within their state. Remote sensing data can track bloom growth and movement and aid in the identification of sampling locations. These data can also, with appropriate caveats, illustrate the extent and location of blooms when reporting test results to the public. Technical aspects of remote sensing are included in Section 4.3.1.3.

5.2.2 Evaluate Sampling and Analysis and Conduct Training

5.2.2.1 Evaluate Sampling Plans

Agencies should evaluate HCB sampling protocols and update them as necessary, particularly if new technologies or sample handling requirements arise due to changes in laboratory methods. Standard Operating Procedures (SOPs) for collecting phytoplankton samples during a potential HCB ensure proper characterization of the bloom and appropriate techniques for collecting samples. SOPs usually include recommendations for sampling types (surface, water column, mat, or scum), locations (areas with evidence of a bloom and the highest risk of exposure within that area), use of preservatives, sample bottles used, holding time, and proper chain of custody. You can find more information on sampling in Section 4.

Commercial test kits are available for screening for cyanotoxins in the field (strip test, Section 4.3.2.1) and quantitative laboratory analysis through ELISA (Section 4.3.2.3) or liquid chromatography/tandem–mass spectrometry (LC/MS/MS, Section 4.3.2.5). The advantages of using kits for cyanotoxin analysis can include:

- Field screening kits can yield immediate results needed for preliminary advisories.
- Lab kits build internal capacity for relatively low cost and training, reduce turnaround time, and meet the accuracy and precision required by USEPA.

If possible, purchase sampling supplies and test kits before bloom season based on the anticipated sampling schedule, proposed number of water bodies to be sampled, and monitoring priorities. Since test kits have a shelf life typically of a year, purchase them when the usable time left is the greatest. Any expired test kits can be kept for training purposes. Determine if kit distribution to partner agencies will assist with sampling efforts and consider staging kits and other equipment at regional offices close to bloom-impacted water bodies if results are time sensitive. Many states have incorporated field and laboratory kits into their response programs and can provide useful information for agencies early in their response planning.

Additional HCB screening methods can include qPCR (Section 4.3.2.6) and fluorometry (Section 4.3.1.3). Laboratory qPCR can be used to screen for genes related to HCB toxin production and help you decide which HCB toxin test to perform. Handheld field fluorometers are another technology available for field screening that can be used by field staff with minimal training. These instruments detect the presence of phycocyanin or phycoerythrin pigment in cyanobacteria using RFUs that indicate the presence of cyanobacteria as well as relative levels. For further details and a comparison of monitoring methods for toxin analysis, see Section 4.3.2.

5.2.2.2 Evaluate Laboratory Analysis Options

Several options are available for cyanobacteria and cyanotoxin analysis:

- in-house cyanobacteria identification or the use of outside labs that can identify cyanobacteria to the species level and provide a numerical count of predominant cyanobacteria taxa
- in-house cyanotoxin analysis or use of a qualified laboratory

USEPA has a list of laboratories that analyze for cyanobacteria and cyanotoxins and their capabilities to analyze parameters of interest within the thresholds established for advisories. Laboratory capabilities may include cyanotoxin analysis as well as cell identification and enumeration. Agencies can also contact local laboratories and generate a list of labs, including their testing capabilities, for reference. After reviewing agency policies on contracting, agencies can establish contracts with laboratories that provide assurance that the laboratories have the capacity to provide accurate data and rapid turnaround time. Use the off-season to review sample load to verify that the laboratories selected are able to meet capacity, and adjust contracts as needed.

It is important to note that several methods exist for cell identification and enumeration and cyanotoxin testing, and these different methods can affect accuracy and reporting. For example, some methods report cyanobacteria enumerations as natural units (colonies), while some report as cells per milliliter (cells/mL). ELISA reports total cyanotoxins but does not identify specific congeners. LC/MS/MS indicates specific congeners of cyanotoxins for which standards are available but not total cyanotoxins, so it is possible to have a non-detect with this method and a positive result for ELISA. See USEPA's web page on cyanotoxin detection methods for more information on different detection methods for cyanotoxins. The laboratory selection process should ensure that the contracted laboratory uses methods that provide data that accurately inform advisory recommendations. Communication of results should specify the method and link to or include directly these differences.

Agencies may consider developing internal laboratory capacity. Upfront costs for equipment needed for ELISA cyanotoxin tests include equipment such as microplate readers and micropipettes. An adequate supply of cyanotoxin kits should be available throughout the season to perform the analysis. The initial equipment purchase is costly, but it is a one-time purchase. Supplies, maintenance, and laboratory staff can be costly and should be considered as part of the annual budget. Microscopy for cyanobacteria identification and enumeration is less expensive than cyanotoxin analysis in terms of equipment and supplies; however, a qualified, trained taxonomist is needed to perform the analysis. Enumeration methods should be reviewed to determine which one provides the most accurate data for regional guidance thresholds (if applicable). Equipment and supplies purchased should be aligned with the chosen method. It is also recommended that in-house staff contact another qualified taxonomist to confirm difficult taxa identification.

Analyses for cyanotoxin testing in plant or animal tissues are not routinely conducted. Extraction of cyanotoxins from plant, animal, and human tissue requires careful preparation, and a single extraction method may not be suitable for all types of tissue (Foss et al. 2018, Sanan et al. 2019). Research on improved tissue extraction and analytical methods is ongoing (Foss et al. 2018).

5.2.2.3 Conduct Training on Sampling and Health and Safety

It is best to train staff, partners, and volunteers in sampling techniques, SOPs, and kit use before the sampling season begins. Training should include familiarization with sampling equipment and methods (such as pipettors and plate readers) and sample preparation techniques (such as rinses and mixing that may be required). Staff training on PPE and safety issues for sampling is also essential, as is maintenance of existing PPE or pre-orders of new PPE to fit sampling staff.

Training can include partner agencies or citizen scientists who may be assisting with sampling. Annual statewide or regional training workshops before bloom season can introduce or review sampling protocols and provide partner agencies with the opportunity to ask questions and receive test kits, if appropriate.

5.2.3 Incorporate HCBs into Public Drinking Water Supply Emergency Response Plans

Public drinking water suppliers using surface water or groundwater under the direct influence of surface water sources that could be impacted by HCBs should consider creating or altering their existing drinking water emergency response plan to include cyanotoxin monitoring and removal, when needed. AWWA and the Water Research Foundation have developed a technical guidance manual for managing cyanotoxins in drinking water with a self-assessment tool for PWS operators to evaluate their risk and ability to handle a detection of cyanotoxins in finished water (AWWA/WRF 2015). In addition, it is recommended that public water suppliers consult with their state drinking water program to ensure that their current emergency response plan conforms to their state's regulations or recommendations regarding HCBs. PWS operators serving more than 3,300 people should consider updating their emergency response plans to include a cyanotoxin event, consistent with requirements under the America's Water Infrastructure Act of 2018. Systems serving fewer than 3,300 people should consider developing emergency response plans even if not required by regulations and consult with state drinking water agencies for technical guidance. If the public water supplier already has an emergency response plan, it may be adaptable to HCBs, particularly if it addresses emergency backup water sources.

Plans could also include monitoring measures for the most common cyanotoxins in the region. USEPA and a number of state agencies have publicly available documents describing cyanobacteria and cyanotoxin monitoring in water bodies used for recreation and as drinking water sources, many of which can be found at USEPA's recommendations for managing cyanotoxins in public drinking water systems and list of state HAB monitoring programs and resources. USEPA's Cyanotoxin Management Tools for Public Water Systems web page also offers tools for preparing a cyanotoxin management plan, treating and monitoring cyanotoxins, and communicating cyanotoxin risks.

5.2.4 Evaluate, Report, and Summarize HCB-related Illness

It is important to evaluate information about individual illness cases during and after the bloom season. It may be helpful to review reports and articles of previous HCB-related human and animal illnesses, including recent research on analytical methods for human and animal tissues, such as those analyzing hair and urine (Backer et al. 2013, Backer et al. 2015, Brown et al. 2018, Dreher et al. 2019, Foss et al. 2019, Hilborn et al. 2014; see also Section 3.2.2). The agency or poison control center tasked with collecting illness reports should draft procedures for internal tracking and submission to the CDC OHHABS reporting system. Year-end summaries of the past year's illness reports should be finalized, and any outstanding illness reports should be submitted to internal reporting systems and OHHABS.

It is important to ensure that personal identification and privacy requirements are met when reporting aggregated illness information from public health agencies to stakeholders or the public. Aggregated reports by county and category (human, pets, livestock, fish, or wildlife) may be sufficient. It may also be helpful to include both the number of initial reports received and the subset that meet internal or OHHABS criteria for reporting illnesses as HCB related. See California's summary of OHHABS reporting.

Previous illness case information may also inform outreach to affected groups and locations. For example, nationwide concerns regarding dog illnesses in 2019 provided the opportunity to promote resources available for dog owners and veterinarians, including USEPA's Protect Your Pooch web page. More information on outreach is included in the following Section.

5.2.5 Develop, Evaluate, and Improve Outreach and Advisory Signage

5.2.5.1 Outreach

Scientists throughout the United States recognize that HCBs are a growing environmental and public health issue with far-reaching consequences. USEPA and many state agencies have prepared and distributed a variety of informational materials on HCBs; however, there are many ongoing and yearly opportunities for public outreach to inform people about the risks HCBs pose to their health and well-being. Agencies and other responsible entities can respond to ongoing blooms and prepare for upcoming bloom seasons by reviewing their outreach methods and materials and adjusting them as needed. Some examples of potential opportunities are included below.

- Outreach events:
    - Use Healthy and Safe Swimming Week information to help public health agencies inform the public about the health effects of exposure to HCBs. The CDC has many Healthy and Safe Swimming Week resources.
    - Provide HCB open houses at the beginning of the bloom season. These open houses can be in-person or virtual events, such as Zoom or Facebook Live events. Coordinate announcements of open houses with partner groups and stakeholders to ensure maximum participation.
    - Time outreach to occur before major summer holidays, including the 4th of July and Labor Day, when HCBs are likely occurring and water recreation is high.
- Coordinated responses with checklists for common questions and responses:
    - Develop official agency talking points and frequently asked questions, and distribute them to anybody who may potentially respond to inquiries, including customer service staff, command center staff, spill hotline staff, and emergency management staff. For examples, see:
        - Minnesota Pollution Control Agency's blue-green algae and harmful algal blooms page
        - Virginia Department of Health's cyanobacteria page
        - CDC's FAQs on HABs and HAB-related health promotion materials, including fact sheets, social media tools, posters, and reference cards that can be modified
        - USEPA's drinking water harmful algal blooms and cyanotoxins FAQs
        - USEPA's cyanobacterial blooms in recreational water web page
- Public outreach and social media messaging:
    - Change out-of-office messages to let callers know how to find information and safety precautions on their own.
    - Develop uniform social media messaging by working with all agencies that may be responding to HCBs.
    - Create messages for topics such as early season bloom awareness, mid-season bloom awareness, or pre-holiday weekend messaging; boilerplate language that can be edited to respond to high-profile events or media stories; and recommendations for dog safety during bloom and waterfowl seasons.
    - For drinking water sources, acknowledge that drinking water treatment can ensure safe drinking water even when recreational advisories are in place. The City of Salem, Oregon, published an after-action report following a significant bloom that impacted its public water supply (City of Salem 2008).
    - Visit Wisconsin's Harmful Algal Blooms Toolkit, which includes easy-to-use guides with general information about HCBs, health and safety information for people and pets, and communication tools.
    - Review and evaluate past social media posts. Questions to consider when evaluating the effectiveness of social media posts include:
        - Did the post get the response expected?
        - Was there confusion? Which parts of the message created confusion?

        - Did the message get derailed?
        - Did the post reach the target audience?
        - Was misinformation disseminated by other parties? If so, how could this information be effectively countered?
- Visual guides:
    - Provide visual examples of blooms to help the public learn to identify potential HCBs for social media and outreach. For examples, see the ITRC *Visual Guide to Common Harmful Cyanobacteria* (Appendix A) or California's quick visual guide fact sheet.
    - Additional examples of visual guides are included in Section 5.2.7, the community science programs portion of this Section.
- Outreach to dog owners and veterinarians:
    - Develop posters for dog owners and coordinate posting at veterinary clinics.
    - Work with state veterinary boards to distribute information to practicing veterinarians.
    - Develop a web page and other outreach resources devoted to dogs and other animals, such as:
        - CDC's Cyanobacterial Blooms and Animals poster
        - California's HABs Portal domestic animal page
        - Wisconsin's Harmful Algal Blooms Toolkit
        - The Utah Department of Environmental Quality's protecting dogs during blooms web page
- Outreach to fishing and hunting communities:
    - Nevada Department of Wildlife's HAB page
    - The Utah Department of Environmental Quality's advice for hunters during HABs web page
    - California Waterfowl article on hunting dogs and HCBs
- Literature reviews to remain up to date on current information; the USEPA Freshwater HABs Newsletter is an excellent place to start
- Surveys:
    - Survey specific groups such as water body managers, public or environmental health department staff, and veterinarians to evaluate their needs for outreach materials.
    - Other studies, including a survey done by the ITRC HCB team and NALMS, indicated regional differences in preferences for HCB notification methods. The ITRC/NALMS survey on HCB notification methods provides information on regional HCB outreach and education efforts in a central location to help decision-makers identify the most effective HCB outreach and education methods. See Appendix B for more details and key findings.
- Communication on HCB management activities:
    - Communicate updates and results when management strategies to control HCBs have begun.
    - Communicate that some HCB management treatments may release cyanotoxins into the water column. Use signage and other communication methods to inform people of the lake's status as changes occur, especially if the appearance of the lake improves while cyanotoxins may still be present.
    - Communicate expectations, effectiveness, and details about chemical treatment and management strategies before the activity begins.

5.2.5.2 HCB Signage

Continue work with partners on developing consistent informational and advisory signage. Some states use a combination of informational or general awareness signage and advisory signage. Informational or general awareness signs, such as those developed by USEPA, can be posted year-round to maintain awareness of potential HCB, general precautions, and how to learn more about them. Advisory signage identifies a current HCB, necessary precautions, and how to learn more. As noted above, surveys and other evaluations can be used to determine the effectiveness of existing signage and potential improvements.

Signs in multiple languages, particularly in both English and Spanish, improve messaging. Icons can communicate necessary precautions for specific activities, such as swimming, boating, or fishing, across languages.

Recreational water examples include:

- USEPA's customizable HCB infographics
- Virginia Department of Health (informational and advisory signage)

- [Wisconsin Department of Health Services]
- [Ohio Department of Health]
- [Utah Department of Environmental Quality]
- New Jersey Department of Environmental Protection's [updated signage with consistent icons across all signage levels] to communicate "ok," "use caution," or "advise against" (Figure 5-3)

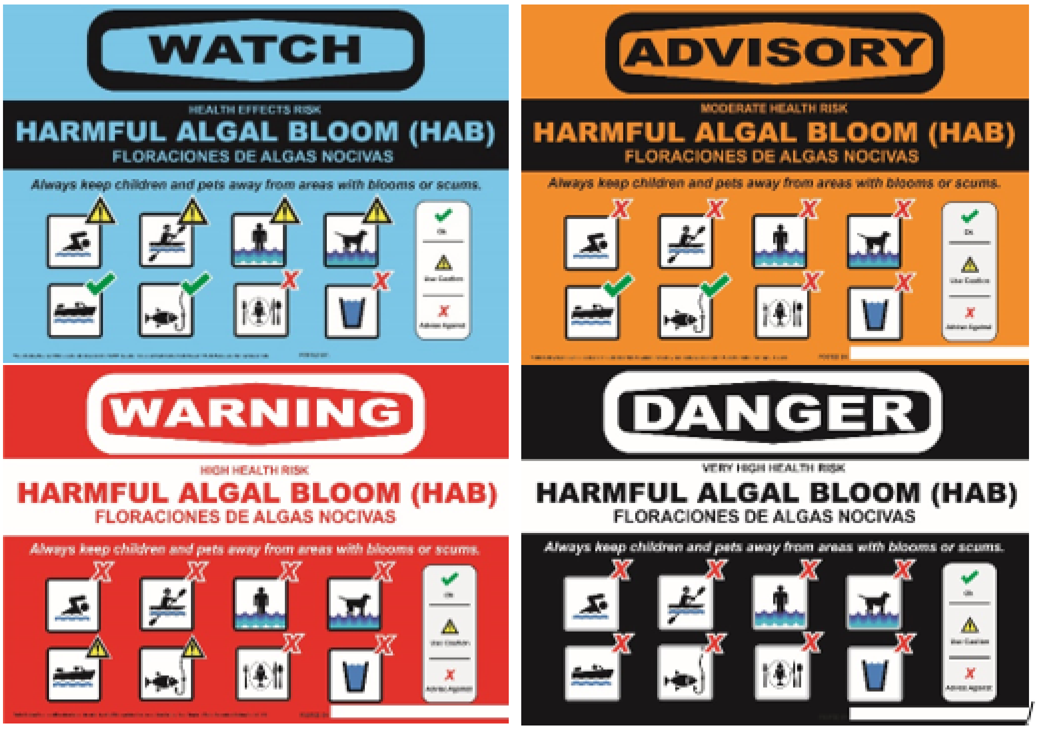

Figure 5-3. New Jersey Department of Environmental Protection HCB 2020 Advisory Signage (Watch, Advisory, Warning, Danger).
Source: New Jersey Department of Environmental Protection. Used with permission.

5.2.5.3 Optimize and Improve Maps and Data Management

Making HCB data available to the public is important for any HCB program. There are many ways to post data, including web pages, social media, online databases, GIS-based mapping programs, and standalone applications such as smartphone apps (for example, the multi-agency [CyAN project]). Recommendations for creating HCB maps include:

- Create maps that identify active blooms and any advisories in effect. Maps on dedicated HCB web pages provide visual and spatial snapshots of bloom conditions that support data and narratives and improve public understanding. See USEPA's [summary of state monitoring programs] for links to state HCB maps and NALMS' [interactive map of local HCB resources].
- Provide narratives and legends that clarify what the data represent. These can include caveats that all blooms in the state may not be represented on the page or map, that the map does not necessarily represent real-time data, that bloom conditions in one area do not mean an entire water body is affected, and that bloom locations can change rapidly due to wind and wave action.

Examples of HCB maps based on advisory levels:

- California's [HABs Portal HAB Incident Reports Map]
- New Jersey Department of Environmental Protection's [Mapping and Communication System]
- Utah Department of Environmental Quality's [Harmful Algal Blooms] webpage

Examples of HCB maps based on cyanotoxin concentrations:

- Washington State Toxic Algae's [website]
- Ohio Environmental Protection Agency's [drinking and recreational water data]

Once the data have been posted for public consumption, consider long-term storage of the information. Historical HCB records can help when evaluating status and trends and planning efforts. Multi-user databases with the ability to share information with other applications and the public can greatly increase your HCB program's productivity. When possible, a team should be identified for developing a new database or a pathway to integrate the HCB data into an existing database. Data on HCBs and HCB-related illnesses may be able to be incorporated into existing public health tracking portals, such as Tracking California.

5.2.6 Continue Coordination

5.2.6.1 Build and Improve Relationships with Internal, External, and Stakeholder Contacts

After each bloom season ends, it is important to continue building the network of people involved in HCB response, such as local or state health departments, laboratories, public drinking water systems, state parks, lake managers, poison control centers, recreational water facilities, emergency preparedness and response agencies, physicians and veterinarians, local governments, Native American tribes, and agriculture organizations:

- Develop lists with key contacts (and their alternatives) for time-critical notifications and ensure that these contacts are entered into an incident report database.
- Refer to USEPA for a list of health and environmental agencies by state or territory for more information.
- Incorporate notification preferences as identified by the ITRC/NALMS notification survey (see Appendix B for a summary of results).
- Consider additional partnerships, such as with land grant university extension specialists. The North Central Region Water Network is a great example of how this networking can expand HCB communication and coordination.

5.2.6.2 Organize Meetings and Workshops

Regular meetings and annual workshops can enhance internal and external coordination. Pre-season workshops for partners can provide an important forum to assess interagency coordination, review lessons learned about bloom response, identify areas for improvement, and exchange information to strengthen HCB responses. Workshops can include distribution of and training for test kit use. Additional suggestions include:

- Schedule monthly HCB update meetings with partners to build and sustain working relationships and ensure ongoing communication among stakeholders.
- Participate in and facilitate trainings, workshops, webinars, and conferences at the local, state, and national level. Check the archives of USEPA's Freshwater HABs Newsletter for HCB-related events and resources through 2020. Along with a monthly newsletter, USEPA offers national and regional webinars and phone meetings, allowing state agencies and other entities the opportunity to learn from each other and from academic researchers. To sign up for these periodic updates, send an email to epacyanohabs@epa.gov.
- The national and regional sections of NALMS provide resources and opportunities to collaborate on water body monitoring and management, including HCBs.
- If possible, offer free access to peer-reviewed literature on HCBs.

5.2.7 Develop a Community Science Program to Increase Monitoring, Testing, and Coverage of Water Bodies

Community science programs can be an effective collaboration between agencies and the communities around a water body, and they can provide low-cost data for the agencies. These programs can also increase the stewardship role of the local community and increase the trust between the community and their local agencies. Historically, there was a hesitancy to use data collected by community scientists. Although there are techniques for weighting community scientist data (tiering, which weights data by the scientific rigor with which it is collected and how the data will be used, is one example), many agencies choose to rely solely on data gathered by trained scientists.

Resources are available to help agencies and communities develop effective community science programs capable of collecting reliable data. Community scientists across the country collect a wide array of water quality information; the Lake Observations by Citizen Scientists & Satellites project and the Phytoplankton Monitoring Network are two examples. Vermont recruits and trains volunteer cyanobacteria monitors and lake water quality monitors. Another example of how community scientists can work with environmental officials is the Cyanobacteria Monitoring Collaboration (see https://cyanos.org), which uses the bloomWatch mobile application and a series of three photographs to show the extent of a bloom. These images, along with a jar and stick test, can be gathered by lake residents, watershed groups, and state personnel to help differentiate between potentially harmful planktonic cyanobacteria taxa and harmless phytoplankton and aquatic plants. Jar and stick tests, which are described in Section 4.3.1.2, use physical properties common to planktonic cyanobacteria to differentiate these potentially harmful organisms from harmless planktonic and filamentous green algae. These tests are an easy first step to help determine the need for site follow-up.

Be open and honest about how the data will be used, and communicate regularly with volunteer scientists to further develop trust between the agency and collaborating communities. In the summer of 2020, the Environmental Law Institute hosted a series of conversations with state agencies to learn about successful programs. A few key takeaways from these conversations are:

- Communication is key. When agencies work with communities, it is essential to:
  - Be completely transparent.
  - Establish clear ground rules, goals, expectations, and objectives.
  - Set clear expectations about what can and cannot be done with the data at the end of the project.
  - Discuss time frames and obstacles, and ensure clear risk communication.
- Those providing data will need to see that the data are being used consistently with initial expectations. Open communication is necessary, because acting after collecting data takes time.
- Work on diversity, equity, and inclusion in who leads and who participates. Communities do not see themselves as passive assistants. Data should be used by communities for communities, not just to contribute to a database.

Additional resources for agencies and potential community scientists include:

- Citizenscience.gov, which is designed to accelerate the use of crowdsourcing and community science across the U.S. government
- Cyanobacteria Monitoring Collaborative, three coordinated monitoring projects to locate and understand harmful cyanobacteria
- USA Volunteer Water Monitoring Network
- NALMS' Secchi Dip-In volunteer lake monitoring
- Lake Observer, a mobile app for recording lake and water observations
- Great Lakes Research and Education Center, linking research and education
- Regional Science Consortium, facilitating research, education, and collaborations with consortium members
- The Environmental Law Institute, which researches effective community science methods and programs. The institute's articles and reports can be found by searching eli.org for *citizen science.*
- USEPA's Citizen Science for Environmental Protection web page

5.2.8 Establish Agreements and Funding Sources

Establish operational memorandums of understanding or interagency agreements, as appropriate, to clarify roles and responsibilities, processes, and shared resources between public health agencies, environmental agencies, laboratories, and water body managers. See USEPA's fact sheet on funding sources for managing cyanobacterial HABs and cyanotoxins in drinking water (USEPA 2017a). Stable and consistent funding can allow for continuity of trained staff, sufficient resources, and well-developed response tools.

5.2.9 Develop and Refine Monitoring Plans for Recreational Waters and Drinking Water Sources

Comprehensive monitoring programs can become very expensive very quickly if the area monitored experiences frequent and widespread blooms. When designing a monitoring approach, it is important to consider how it will inform and support HCB management and response activities. Monitoring programs serve an important role in HCB response, as they can provide information on current conditions, variability across space and time, and insight into long-term changes at water bodies. Monitoring data generate critical information for public health responses and serve as educational resources for the general public. Blooms often appear rapidly and fade quickly, and it is not possible to capture every HCB that occurs. Instead, there is value in focusing on indicators that HCBs are increasing, that cyanotoxins are present, or that important uses, such as beaches, drinking water, or wildlife, are threatened. Long-term monitoring programs can provide insight into the frequency, extent, and magnitude of HCBs. For technical details on monitoring options, see Section 4.

It is also helpful to perform post-action evaluation to improve future response and develop management and prevention recommendations. This evaluation can include surveys to partners and stakeholders requesting feedback on the success of response actions and areas for improvement. For large bloom events that affect a wider area, entities may wish to provide an assessment of what worked well, what did not work well, and lessons learned (City of Salem 2008).