MEMORANDUM OF UNDERSTANDING
TO IMPLEMENT THE NEVADA CYANOBACTERIAL HARMFUL ALGAL BLOOM STRATEGIC RESPONSE PLAN

A. BACKGROUND

Cyanobacterial harmful algal blooms (HABs) pose a public health risk. An increase in the frequency and magnitude of HABs in Nevada has been observed since monitoring started in 2019. The detection and response to HABs is challenging due to the transitory spatial and temporal distribution of blooms, combined with limited resources for monitoring and response from any single agency. Therefore, an agreement is needed between Nevada state agencies to establish protocols for collaboration on monitoring and response actions.

B. PURPOSE & GOALS

The purpose of this Memorandum of Understanding (MOU) is to provide a coordinated statewide response to safeguard human and wildlife health from potential threat of HABs.

C. PARTIES, ROLES & RESPONSIBILITIES

The agencies subject to this MOU are the Nevada Division of Environmental Protection (NDEP), the Nevada Department of Health and Human Services - Office of State Epidemiology (OSE), the Nevada Division of State Parks (NDSP), the Nevada Department of Wildlife (NDOW), and the Nevada Department of Agriculture (NDA) (collectively “the parties”). The roles, responsibilities, guidelines, and procedures agreed upon in this MOU are detailed in the document “Nevada Cyanobacteria Harmful Algal Bloom Strategic Response Plan (2024)” (hereafter referred to as “the SRP”). The guidelines and procedures detailed in the SRP are intended to improve predictability, consistency, and allow for reliable sharing of information between the parties, with the goal of protecting human health from the adverse effects of exposure to HABs.

D. GENERAL PROVISIONS

i. Nothing in this agreement is intended to diminish or otherwise affect the authority of any party to implement its respective statutory functions.

ii. Nothing in this agreement will be interpreted as limiting, superseding, or otherwise affecting the parties' normal operations. This agreement also does not limit or restrict the parties from participating in similar activities or arrangements with other entities.

iii. Due to the dynamic nature of the state of the science of harmful algal blooms, the parties agree to review the SRP annually and revise, as necessary.

iv. This MOU may be revised by mutual consent of all parties.

v. Any signatory may terminate its participation in this MOU, with or without cause, after providing 30 calendar days written notice to the other parties.

vi. Nothing in this MOU creates any legal rights, obligations, benefits, or responsibilities, substantive or procedural, enforceable at law or in equity.

E. TERM AND UPDATE

This agreement is effective upon the signing of all parties and will remain in effect until a revised agreement is approved and executed by the parties.

_____

JENNIFER L CARR, PE, CPM, CEM
Administrator,
Nevada Division of Environmental Protection,
Department of Conservation and Natural Resources

_____

[Date]

_____

MELISSA PEEK-BULLOCK, MPH
State Medical Epidemiologist,
Office of State Epidemiology,
Division of Public and Behavioral Health,
Nevada Department of Health and Human Services

_____

[Date]

_____

CHRIS CROOKSHANKS
Fisheries Division Administrator
Nevada Department of Wildlife

_____

[Date]

_____

ROBERT MERGELL
Administrator
Nevada Division of State Parks

_____

[Date]

_____

J.J. GOICOECHEA
Director
Nevada Department of Agriculture

_____

[Date]

Nevada Cyanobacterial Harmful Algal Bloom Strategic Response Plan

May, 2024

NEVADA DIVISION OF ENVIRONMENTAL PROTECTION

NEVADA DEPARTMENT OF WILDLIFE

THE OFFICE OF STATE Epidemiology

NDA Nevada Department of Agriculture

NEVADA STATE PARKS

NEVADA DIVISION OF STATE PARKS

This page left intentionally blank

Contents

1. Introduction

1.1 Background

Cyanobacterial toxins (also known as blue-green algal toxins) in fresh surface waters have been implicated in human and animal illness. During 2020, 227 cyanobacterial bloom events resulted in 95 cases of human illness and 1,170 cases of animal illness in the United States (CDC, 2022). In Nevada, cyanobacteria are naturally present in surface waters and play a functional role in aquatic food-webs and biochemical processes. When specific conditions that are favorable to cyanobacteria occur, such as high nutrients and warm temperatures, these organisms can reproduce rapidly. This dense growth of algae is called a bloom and can sometimes lead to a harmful algal bloom (HAB). These conditions tend to occur in the warmer months after spring rainfall and snowmelt runoff have accumulated high nutrient loads from animal waste, agricultural fertilizers, sewage effluent, and urban stormwater runoff into surface waters (EPA, 2019). HABs can also occur in winter months, although winter-dominant algal species have been found to be different from those of spring and summer.

Freshwater cyanobacteria can produce potent toxins (cyanotoxins) that may cause damage to the liver, skin, and nervous system. HABs vary in toxicity and may pose a direct threat to human and animal health. Exposure to cyanotoxins can result in adverse human health effects such as: hay fever-like symptoms, respiratory distress, skin rashes, vomiting, and diarrhea among other symptoms. These cyanotoxins have also been identified as the cause of many animal deaths in the United States. Exposure to cyanotoxins most commonly occurs when people or animals have direct contact with, ingest, or inhale contaminated water. There are no known antidotes to cyanotoxins, so preventing exposure is imperative. Details on common cyanotoxins and the symptoms they cause can be found in **Table 1**.

1.2 Purpose and Scope

The purpose of the Nevada Cyanobacterial Harmful Algal Bloom (HAB) Strategic Response Plan (Response Plan) is to provide a unified statewide approach to detect, monitor, and respond to HABs in a way that is consistent across partner agencies, and thereby protect the public from risks associated with exposure to cyanotoxins. Although the primary focus of the Response Plan is the protection of human health, it also provides information and recommendations regarding exposure and prevention of potential impacts to pets, livestock, and wildlife. The Response Plan is designed to identify:

- Entities responsible for response and actions;
- Recreational risk thresholds and appropriate responses to protect public health and safety;
- Acceptable parameters and methods for assessing risk;
- Appropriate monitoring and analysis protocols to identify cyanobacteria and determine concentrations of cyanobacteria and cyanotoxins; and
- Recreational Advisory Levels, recommended advisory language and other related communication mechanisms.

The scope of the Response Plan is for freshwater lakes, wetlands, ponds, reservoirs, rivers, and streams with potential public access and recreational use. These waterbodies may be owned or operated by

state, county, municipal, or federal agencies. As such, coordination of the investigation and response activities will vary depending on ownership.

2. Agency Responsibilities

This plan outlines the interaction, responsibilities, and activities of Nevada partner agencies and other stakeholders to ensure that HAB investigations are conducted in a rapid, consistent, and effective manner. The plan is founded on the principles outlined below.

- ❖ Response procedures described in this document should be limited to "Public Waters of the State";
- ❖ Response should be as rapid as practicable considering the resources available;
- ❖ Partner agencies, to the best of their ability, should initiate coordination on HAB response activities when potential HABs are observed;
- ❖ Any incidence of illness associated with a potential cyanobacteria bloom, either human or animal, should be reported as soon as practicable to the Nevada Division of Environmental Protection (NDEP) and the Nevada Department of Health and Human Services, Office of State Epidemiology (OSE);
- ❖ NDEP will be the primary agency responsible for monitoring, although other agencies may contribute to monitoring efforts if resources allow;
- ❖ OSE will be the primary agency responsible for issuing recreational advisories, although other agencies may issue notices, such as social media posts or via agency websites, as necessary;
- ❖ Monitoring may include: remote sensing, photo documentation, field testing, and/or cyanotoxin analysis. All available information will be used to issue public health advisories;
- ❖ When requested, NDEP will provide training for partner agencies to ensure the effective coordination and consistency of response;
- ❖ The Response Plan is a dynamic document that is reviewed on a regular basis and revised as needed by partner agencies.

2.1 Nevada Division of Environmental Protection (NDEP)

The Nevada Division of Environmental Protection responsibilities shall include:

- Coordinate Nevada HAB Task Force meetings. Meetings will be held bi-monthly during the HAB index period from May through September, in addition to pre- and post-index period meetings;
- Develop monitoring and analysis capacity for cyanobacteria/cyanotoxins;
- Maintain a HAB reporting platform for partner agencies and the public to report potential HAB occurrences. Collect and review reports following submissions,

and determine who should be contacted for follow-up.

- Validate incoming requests for the investigation of cyanobacteria blooms and initiate monitoring activities if deemed appropriate and resources allow;
- Coordinate a rapid response for collection and analysis of cyanotoxin samples if resources allow; as needed, promptly relay incoming reports of illness related to cyanobacteria from the public to OSE and other waterbody managers;
- Monitor and analyze potential HABs. Develop and update annually a HAB monitoring plan to guide monitoring resources to identify potential HABs;
- Develop and update as needed the HAB Monitoring standard operating procedures (SOP) and disseminate to partner agencies assisting with sample collection (Appendix A);
- If deemed appropriate by NDEP, analyze water samples to determine the concentration of cyanotoxins such as microcystin, cylindrospermopsin, and anatoxin-a, as needed. Samples may be analyzed by NDEP or sent to a certified analytical laboratory for analysis;
- Provide timely reports to OSE and waterbody managers with analytical results;
- Coordinate with the applicable agency representatives for the preparation and release of public notifications, as warranted.

2.2 Nevada Department of Health and Human Services, Office of State Epidemiology (OSE)

The Nevada Office of State Epidemiology responsibilities shall include:

- Attend Nevada HAB Task Force coordination meetings;
- Issue recreational advisories for waters where thresholds have been exceeded;
- Maintain the Nevada HAB Dashboard. The Nevada HAB Dashboard serves as an up-to-date resource for the public and stakeholders to view waterbody status;
- Provide technical advice on the public health aspects of HABs and coordinate the state's public health response;
- Coordinate with partner agencies on development of guidelines/thresholds for cyanotoxins for recreational risk and drinking source water risk;
- Coordinate with partner agencies on information dissemination and outreach to local health departments and the public regarding the effects of HABs;
- Coordinate with the applicable Public Information Officer(s) (PIO) for the preparation and release of public notifications, as warranted;
- Interview cases of human illnesses associated with reports of HABs;
- Collect information on reports of animal illnesses associated with reports of HABs
- Collect data and information (human, animal, environmental) from reported HABs and report to the Centers for Disease Control and Prevention (CDC) One Health Harmful Algal Bloom System (OHHABS).

2.3 Nevada Division of State Parks (NDSP)

The Nevada Division of State Parks responsibilities shall include:

- Attend Nevada HAB Task Force coordination meetings;
- Visually monitor State Park lakes for HAB development and initiate communication with partner agencies when potential HABs are observed;
- Assist in monitoring response activities, including visual monitoring, field tests, taking photographs, and water sample collection in accordance with the HAB Monitoring SOP (**Appendix A)**;
- When necessary, post notices to inform the public of potential or confirmed HABs, including posting of recreational advisories;
- Make decisions about implementing procedures for the protection of public health, including restricting access to State Park waterbodies where cyanobacteria blooms have been confirmed;
- Provide outreach and education to the public about HABs;
- Coordinate with the applicable agency representatives for the preparation and release of public notifications, as warranted.

2.4 Nevada Department of Wildlife (NDOW)

The Nevada Department of Wildlife responsibilities shall include:

- Attend Nevada HAB Task Force coordination meetings;
- Receive and review notifications of HAB occurrences that may affect wildlife;
- Visually monitor lakes and streams for HAB development during normal field operations and initiate communication with partner agencies when potential blooms are observed;
- Assist in monitoring activities, including visual monitoring, field tests, taking photographs, and water sample collection in accordance with the HAB Monitoring SOP (**Appendix A)**;
- When possible, post notices to inform the public of potential or confirmed HABs, including posting of recreational advisories;
- Provide outreach and education to the public about HABs;
- Coordinate with the applicable agency representatives for the preparation and release of public notifications, as warranted.

2.5 Nevada Department of Agriculture (NDA)

- Attend Nevada HAB Task Force coordination meetings;
- Receive and review notifications of HAB occurrences that may affect livestock;
- Notify NDEP of HAB reports received by NDA;
- Notify and issue notifications and information to livestock owners as appropriate to protect livestock health;
- After initial response and issuing of a notification, communicate status to livestock owners until the advisory is ultimately lifted.

2.6 Tribes

When HABs are suspected or confirmed on waterbodies that are:

- within tribal boundaries,

- are adjacent to shoreline that is tribally owned,
- are subject to tribal water rights,
- have any other legal tribal interests,

NDEP will initiate response coordination with tribal environmental/public health staff. Communications will be directed through the NDEP tribal liaison's office. When requested and if possible, monitoring assistance will be provided, and analysis data will be shared with tribal staff. Additionally, at the request of tribal staff, NDEP will assist with coordination of response activities, such as providing resources and materials for public notices, etc.

2.7 Other Entities

As necessary and appropriate, other entities may assist with monitoring and response activities. Such entities may include:

- Other state/federal agencies;
- Local governments;
- Non-profit organizations;
- Regional sub-conservancy groups;
- Citizen groups; and
- HOAs.

If requests for monitoring or response activities are received, NDEP will coordinate with the partner agencies to recommend an appropriate response. Partner agencies may provide technical assistance for such activities if appropriate.

3. Advisories

3.1 Human and Animal Health Impacts

The most common exposures to cyanotoxins occur during recreational activities by mouth, skin, eye contact, and inhalation routes (EPA, 2018). Oral exposure may occur from accidental or deliberate ingestion of contaminated water. Dermal exposure may occur during recreational activity in water containing cyanobacteria by direct contact of exposed parts of the body. In addition, contaminated aerosols may be inhaled while recreating. Adverse health effects from recreational exposure to cyanotoxins can range from a mild skin rash to serious illness in humans and animals, and potentially death for animals.

Many factors determine whether exposure to HABs will cause adverse health effects. These factors include, but are not limited to:

- Toxin type and concentration;
- Duration and route of exposure, and;
- Any comorbid conditions of the patient (more than one disease or condition is present in the same person at the same time).

Cyanotoxin	Acute Health Effects in Humans	Most common Cyanobacteria Producing the Toxin
Microcystin	Abdominal Pain, Headache, Sore Throat, Vomiting and Nausea, Dry Cough, Diarrhea, Blistering around the Mouth, Pneumonia, and Liver Toxicity.	*Microcystis*, *Anabaena*, *Nodularia*, *Planktothrix*, *Fischerella*, *Nostoc, Oscillatoria*, and *Gloeotrichia*
Cylindrospermopsin	Fever, Headache, Vomiting, Bloody Diarrhea, Liver Inflammation, and Kidney Damage	*Cylindrospermopsis raciborskii, Aphanizomenon flos-aquae, Aphanizomenon gracile, Aphanizomenon ovalisporum, Umezakia natans, Anabaena bergii, Anabaena lapponica, Anabaena planctonica, Lyngbya wollei, Rhaphidiopsis curvata,* and *Rhaphidiopsis mediterranea*
Anatoxin-a group	Tingling, Burning, Numbness, Drowsiness, Incoherent Speech, Salivation, Respiratory Paralysis Leading to Death	*Chrysosporum (Aphanizomenon) ovalisporum, Cuspidothrix, Cylindrospermopsis, Cylindrospermum, Dolichospermum, Microcystis, Oscillatoria, Planktothrix, Phormidium, Anabaena flos-aquae, A. lemmermannii Raphidiopsis mediterranea (*strain of *Cylindrospermopsis raciborskii), Tychonema* and *Woronichinia*

Table 1. Primary Cyanotoxins and their Associated Human Health Effects (EPA, 2018)

While determining the type of cyanotoxin that has caused illness can be difficult, some commonly reported symptoms following cyanotoxin exposure are listed in **Table 1**.

Animals can be exposed to cyanobacterial blooms in the same way that humans are exposed (CDC, 2022). These routes include ingestion, inhalation, skin contact, and eye contact. Exposure can occur while swimming, by licking cyanobacteria or cyanotoxins off their fur or hair, or by eating cyanobacterial mats found in or near the water. Domestic animals, especially dogs, may be early victims of HABs. Animals are often the first to be affected because they are more likely than humans to swim in or drink water contaminated by HABs, even if it looks or smells bad. Health effects seem to be more serious in animals than in humans. This might be the result of higher ingested doses or a difference in their reaction to cyanotoxins. Exposures to cyanotoxins have killed fish, dogs, cattle, birds, and other wildlife.

The Centers for Disease Control and Prevention (CDC) suggests that if a person or pet comes in contact with a HAB, they should wash themselves and/or their pets thoroughly with uncontaminated fresh water. If water is ingested from where a HAB is present, they should call a doctor, a Poison Control Center, or a veterinarian. Call a veterinarian if a pet displays any of the following symptoms of cyanobacteria exposure: loss of appetite, loss of energy, vomiting, stumbling and falling, foaming at the mouth, diarrhea, convulsions, excessive drooling, tremors and seizures, or any other unexplained sickness after being in contact with water.

3.3 Guidelines for Issuing Public Health Advisories

Advisories will be based on three levels of public health protection recommendations derived from the three levels of recreational risk. The document "RATIONALE: Nevada's Recreational Risk Thresholds for Cyanobacteria" describes the how the recreational risk thresholds were derived (**Appendix B)**. The three levels of public health advisories are "HAB Watch" for Low Risk; "HAB Warning" for Moderate Risk; and "HAB Danger" for High Risk. These advisory notification levels are determined by the concentration of harmful toxins and other indicators of potential hazards (**Table 2**).

> **HAB Watch** – *serves as an advisory to notify the public that hazardous conditions are possible or present. A HAB Watch may be issued based on visual confirmation of a bloom, cyanotoxin concentrations, and/or cyanobacteria cell concentrations. Visual confirmation is determined by qualified NDEP staff working with lake managers and/or managing agencies using jar tests, photographs, or site visits. A HAB Watch should be issued if it has been analytically determined that the concentration of microcystins >4 µg/L, or concentration of cylindrospermopsin >8 µg/L, or concentration of anatoxin-a >1 µg/L. A HAB Watch should also be issued if the cyanobacteria cell concentration is >20,000 cells/mL, based on satellite data or taxonomic enumeration. People and pets should use caution when in contact with lake water and avoid areas of algae accumulation.*
>
> **HAB Warning** -- *serves as an advisory to notify the public that conditions are expected to be unsafe for human exposure. A HAB Warning can be issued if it has been analytically determined that the concentration of microcystins is >8 µg/L, or concentration of cylindrospermopsin is >15 µg/L, or concentration of anatoxin-a is >20 µg/L. If there is verification of significant cyanobacterial surface scum present a HAB Warning may be issued. It is acceptable for action to be taken over and above those listed in the HAB Watch, such as restricting or prohibiting public exposure.*
>
> **HAB Danger** – *serves as an advisory to the public that extreme HAB conditions exist. At this level, it has been analytically determined that the microcystins concentration is >2,000 µg/L, or concentration of cylindrospermopsin is >17 µg/L, or concentration of anatoxin-a is >90 µg/L. It is acceptable for either a portion of the waterbody, or entire waterbody, to be closed and in some cases the adjacent public land (e.g., approximately 100 ft. from the shoreline) to be closed to the public. Actual setback distances will be determined on a site-specific basis, if necessary, by waterbody managers. When partial closures (i.e., beach or cove) are issued, HAB Watch status should be issued for the remaining lake or zone area at a minimum.*

Advisory Threshold Determination		
Advisory Thresholds	**Advisory Level**	**Recommended Actions**
Cyanotoxin Concentration of **Microcystin ≤4 µg/L** **OR** **Cylindrospermopsin ≤8 µg/L** **OR** **Anatoxin-a ≤1 µg/L**	None – Waterbody clear	None
Visual confirmation of bloom* **OR** **Cyanobacteria Cell Concentration of 20,000 cells/mL, Based on Satellite Data or Taxonomic Enumeration** **OR** **Cyanotoxin Concentration of** **Microcystin >4 µg/L to ≤8 µg/L** **OR** **Cylindrospermopsin >8 µg/L to ≤15 µg/L** **OR** **Anatoxin-a >1 µg/L to ≤20 µg/L**	**Waterbody will be placed on a HAB WATCH Advisory**	» Post signage » Post advisory on OSE Dashboard » Issue social media release
Presence of significant cyanobacterial surface scum* **OR** **Cyanotoxin Concentration of** **Microsystin >8 µg/L to ≤2,000 µg/L** **OR** **Cylindrospermopsin >15 µg/L to ≤17 µg/L** **OR** **Anatoxin-a >20 µg/L to ≤90 µg/L**	**Waterbody will be placed on a HAB WARNING Advisory**	» Post signage » Post advisory on OSE Dashboard » May restrict direct contact with water » Issue social media release » Issue press release
Cyanotoxin Concentration of **Microsystin >2,000 µg/L** **OR** **Cylindrospermopsin >17 µg/L** **OR** **Anatoxin-a >90 µg/L**	**Waterbody will be placed on a HAB DANGER Advisory**	» Close portions of the waterbody or the entire waterbody. If necessary – close adjacent land up to 100 ft from shoreline. » Post signage » Post advisory on OSE Dashboard » Issue press release

Table 2. Advisory Level Determination - *NDEP will recommend advisory levels when the supporting evidence consists of only non-numerical information, such as photographs and field observations. Non-numerical evidence should be submitted to NDEP for quality assurance, after which it will be forwarded to OSE along with recommendations on recreational advisory levels based on the Advisory Level Determination chart.

3.4 Downgrading or Removing Advisories

A recreational advisory will remain in effect until sufficient data have been collected to indicate cyanotoxins are no longer present in the waterbody*. The most recent toxin and cell count values will determine the HAB status of a waterbody, except if it is under HAB Warning or HAB Danger status due to cyanotoxin concentrations. In these cases, at least two consecutive sampling events, taken at least 24 hours apart, with cyanotoxin levels below the applicable threshold must occur before a HAB Warning or HAB Danger advisory can be removed (EPA, 2019).

When possible, resources should be allocated to regular follow-up monitoring after a waterbody has received a recreational advisory. Priority should be given to waterbodies with HAB Warning and HAB Danger advisories, and those with contact recreation and municipal/domestic supply beneficial uses, as those pose the greatest health risk, while also having the largest impact on recreational use. When resources allow, NDEP will conduct routine monitoring of waters with recreational advisories until the advisory is lifted. If monitoring is not possible, NDEP will provide technical support to partner agencies so ongoing monitoring may be conducted.

**Exceptions: A lake/reservoir mixing/turnover event or a waterbody freeze event may allow an advisory to be lifted from a waterbody.*

3.5 Advisory Response Actions

When possible, the following actions should be taken for each advisory level:

- A notification of the recreational advisory should be posted to OSE's HAB Dashboard. The notification should include information sufficient to warn the public of potential hazards.
- NDEP will post a notification on the NDEP HAB webpage (https://ndep.nv.gov/water/rivers-streams-lakes/water-quality-monitoring/harmful-algal-bloom-program) , and an alert will be distributed to partner agencies via a Nevada HAB Task Force Listserv.
- The appropriate HAB advisory signage (**Appendix C)** should be posted at the impacted waterbody. Signs should be placed at primary public access locations such as beaches, marinas, boat ramps, and other main points of entry to the waterbody. If the provided signage is not used, then sign information should include:
  - Cyanobacteria are/may be present, and the body of water may be unsafe for people and animals;
  - People should use caution when contacting lake water and wash with clean water afterward;
  - Discourage people from having contact with the water near visible blooms (e.g., no swimming, waterskiing);
  - Discourage allowing pets to drink or swim in the water. If pets do come in contact with the water, then they should be rinsed off with clean water immediately;
  - Contact information for the posting authority;
  - The date of the posting;
  - The symptoms of cyanobacterial exposure;
  - What to do in case of contact with the water; and

- Who to call in case of illness potentially associated with exposure.
- Indicate that if fish are caught, the fish should be properly cleaned and rinsed with clean potable water, and all internal organs removed, with only the fillets retained for human consumption. (This only applies to waterbodies without existing fish consumption advisories.)

- Waterbody managers may choose to restrict access to an entire waterbody, or a portion thereof based on advisory level, magnitude of threshold exceedance, location of bloom, or potential for recreational or incidental contact with cyanobacteria bloom. Managers may request technical guidance from NDEP, however, public safety decisions must be made by the managers and their agency.
- Partner agency PIOs may issue notifications on applicable online platforms, such as social media, using the provided templates (**Appendix D)**.
- If appropriate, media outlets may be contacted to inform a broader audience of potentially hazardous conditions, particularly regarding waterbodies with higher levels of advisories. Agency PIOs will coordinate this response.

4. Monitoring Procedures

Partner agency staff should consider adopting a risk-based monitoring plan for recreational waters that are potentially vulnerable to HABs in order to prioritize their monitoring resources by considering both the potential for HABs and potential frequency of recreational contact. The prioritization of monitoring locations and sampling frequency should include an evaluation of the recreational waters including geographic location, and an assessment of site-specific information and the potential risk that a HAB at the site would present to human health and the health of animals, including pets, wildlife, and livestock. This step-by-step process may be informed by how the waterbody is used by people, whether pets or livestock may access it, and other relevant factors. This process will also allow reduction of efforts in locations where HABs are not likely to occur, potential exposure risk is considered to be low, or where resources to sample is high. For example, agency staff might choose waterbodies to closely monitor throughout the swim season based on the designated uses, the proximity to populated areas, the average number of recreational users, and whether HABs have occurred in the past.

4.1 Routine Monitoring for Blooms

The Nevada HAB Satellite Remote Sensing Tool will be used by NDEP to regularly monitor the larger recreational waters of the state. The data produced by the satellite tool will provide insight into the extent and magnitude of potential blooms, which will allow NDEP to provide guidance on monitoring resource allocation. The satellite tool will provide automated notifications as concentrations of cyanobacteria cells exceed user defined thresholds. With the often changing and transitory nature of HABs, this service will be invaluable for locating potentially hazardous blooms while freeing resources from constant on-the-ground monitoring.

On site, there are multiple indicators that partner agencies can use to determine the potential presence of HABs including visible discoloration of a waterbody due to suspended cell filaments or scums (e.g., a red, green, or brown tint); thick, mat-like accumulations on the shoreline and surface; foul odors and soupy-consistency of the water; and fish kills.

One or more field screenings may be performed to verify whether a potential HAB is present. These procedures are described in the Monitoring SOP (**Appendix A)**.

4.2 Reporting, Sampling, and Analysis of Potential HABs

If during routine monitoring a potential HAB is identified, a report should be submitted to NDEP (see NDEP HAB webpage for reporting instructions). NDEP staff will review reports and other supporting documentation and data, such as photographs, field test reports, and reports of visual assessments, to determine whether a **HAB WATCH** advisory should be issued by OSE and if additional monitoring actions should take place.

For a summary, see the HAB Response Flowchart (**Appendix E**).

When reports of potential HABs are submitted to NDEP, qualified staff will analyze the reports and supporting documentation to determine if hazardous conditions may be present. Methods used for making these determinations could include reviewing photographic evidence, corroborating reports with satellite data, and analyzing historic data. If NDEP staff determine that a potentially hazardous cyanobacteria bloom is present, they may recommend sample collection for cyanotoxin analysis. Cyanotoxin samples should not be submitted to NDEP for analysis without first receiving confirmation from qualified NDEP staff that a potentially hazardous cyanobacteria bloom is suspected to be present at a level that could potentially warrant an advisory, and that samples should be submitted. If a partner agency wishes to conduct cyanotoxin analysis at their own expense, they may submit samples to a certified analytical laboratory and results should be submitted to NDEP for advisory determinations and database entry.

After confirmation of a potentially hazardous cyanobacteria bloom, NDEP staff or other trained state staff may collect water samples for cyanotoxin analysis. Sampling must be conducted in accordance with the HAB Monitoring SOP (**Appendix A)**. Cyanotoxin samples should be submitted to NDEP for analysis (see SOP for submission procedures). Analysis will be conducted by NDEP staff in a timely manner, and results of analysis will be made available to stakeholders within 48 hours of receipt. If cyanotoxin concentrations prompt a change in advisory status, NDEP will notify the partner agencies via the HAB Taskforce Listserv. If a change in advisory level is warranted, advisory response procedures may take place.

5. Field Assessment and Sampling Procedures

Field assessment and sampling procedures should follow the HAB SOP. NDEP will be offering trainings with partner agencies to ensure familiarity with protocols to ensure to ensure protocols are implemented correctly. See HAB Monitoring SOP (**Appendix A)**.

6. Data and Resources

NDEP maintains a large database of water quality data, including hundreds of parameters, for thousands of monitoring stations. HAB monitoring data will be kept and maintained by NDEP in accordance with their normal data handling procedures. Data to be kept will include:

- Photographic documentation
- Visual and field assessment reports
- HAB reports
- Taxonomic data
- Cyanotoxin data
- Enumeration data

Data will be collected, reviewed, stored, and managed in accordance with the Nevada Quality Assurance Program Plan for the State of Nevada (https://ndep.nv.gov/uploads/water-wqm-docs/QAPP_FINAL_2020.pdf). All data analyzed or received by NDEP will be organized and disseminated to the partner agencies via two methods:

1. New data that result in a new exceedance of recreational risk thresholds, or conversely, a new non-exceedance of recreational risk thresholds, will be communicated through **Nevada HAB Updates Listserv**. OSE and NDSP staff can take advisory issuance and advisory response actions based on these notifications.
2. Weekly reports will be issued by NDEP that summarize changes in waterbody status for all monitored waters, in addition to other relevant programmatic updates (**Appendix F)**.

A record of the issuance and lifting of advisories will be kept by OSE within their database including CDC's OHHABS.

Other resources, such as signs, posters, pamphlets, etc., will be available to the partner agencies on the NDEP HABs webpage.

Sources

CDC. “Illness and Symptoms: Cyanobacteria in Fresh Water | Harmful Algal Blooms | CDC.” *Www.cdc.gov*, 2 May 2022, www.cdc.gov/habs/illness-symptoms-freshwater.html#:~:text=People%20exposed%20to%20cyanotoxins%20by.

---. “Summary Report – One Health Harmful Algal Bloom System (OHHABS), United States, 2020 | CDC.” *Www.cdc.gov*, 21 Oct. 2022, www.cdc.gov/habs/data/2020-ohhabs-data-summary.html#:~:text=During%202020%2C%20227%20HAB%20events. Accessed 5 Feb. 2024.

EPA. *Final Technical Support Document: Implementing the 2019 National Clean Water Act Section 304(A) Recommended Human Health Recreational Ambient Water Quality Criteria or Swimming Advisories for Microcystins and Cylindrospermopsin*. 2021.

---. “Health Effects from Cyanotoxins | US EPA.” *US EPA*, 16 Aug. 2018, www.epa.gov/cyanohabs/health-effects-cyanotoxins.

---. *Office of Water Office of Water Recommendations for Cyanobacteria and Cyanotoxin Monitoring in Recreational Waters*. 2019.

---. *Recommended Human Health Recreational Ambient Water Quality Criteria or Swimming Advisories for Microcystins and Cylindrospermopsin*. 2019.

Utah State University. *Simplified HAB Field Identification Instructions Identify Presence or Absence of a Bloom*.

APPENDIX A:

HARMFUL ALGAL BLOOM STANDARD OPERATION PROCEDURES

Harmful Algal Bloom Monitoring

Standard Operating Procedures

Prepared by:

State of Nevada

Department of Conservation and Natural Resources

Division of Environmental Protection

Bureau of Water Quality Planning

Carson City, Nevada

April 2024

APPROVALS:

Jason Kuchnicki

NDEP BWQP Chief: **Date:**

Weston Fettgather

NDEP BWQP Quality Assurance Officer: **Date:**

1.0 Purpose and Applicability

The Harmful Algal Bloom (HAB) Standard Operating Procedure (SOP), prepared by Nevada Division of Environmental Protection (NDEP), Bureau of Water Quality Planning (BWQP), will be used by any entity participating in HAB monitoring activities. The purpose of the HAB monitoring and sampling program is to protect the public from health risks associated with exposure to cyanobacteria and related toxins.

This document includes sampling safety when handling HABs, sampling location selection, test/sample collection procedures, and test/sampling processing procedures. Monitoring and measuring the presence of HABs and the concentration of cyanotoxins is critical to assessing human health risks and making decisions about posting health advisories at lakes and reservoirs. This SOP provides protocols for the following cyanobacteria monitoring, testing, and sampling methods:

- Satellite monitoring;
- Visual monitoring;
- Jar Test;
- Stick Test;
- Grab samples for cyanotoxin analysis;
- Grab samples for eDNA analysis;
- Procedures for conducting toxin analyses using the HACH LightDeck Mini;
- Procedures for sending samples to analytical laboratory for further analysis

2.0 Safety

Exposure to cyanotoxins, even at very low doses, can present potential risks including skin rashes (contact dermatitis), upper respiratory irritation, and other effects from recurring low level (chronic) exposures. Samplers should have training for cyanobacteria sampling in accordance with federal, state, and local requirements, including (but not limited to) safety protocols and appropriate use of personal protective equipment (PPE) such as the selection and use of appropriate gloves to reduce skin exposure while sampling. Occupational exposure risk prevention is the responsibility of each monitoring entity.

Samplers are encouraged to wear appropriate PPE throughout sample collection and processing. Because cyanobacteria may be toxic, avoid having sample water contact the skin; always wear gloves and avoid splashing or other indirect contact with the face. Safety plans are recommended to be developed and reviewed prior to each sampling event. Suggested items for inclusion in the safety plan may include nearest emergency facilities, phone numbers of emergency contacts, potential hazards, such as weather, animals, flow/discharge schedules, etc.

3.0 Site Selection

HABs typically occur during the warmer summer months after spring rainfall and snowmelt runoff have accumulated high nutrient loads from animal waste, agricultural fertilizers, sewage effluent, and urban stormwater runoff into surface waters. However, the precise time of year and location of HABs occurrences varies. Regularly utilizing visual monitoring, satellite monitoring, and communicating across agencies, particularly in spring and early summer, will allow the State to effectively protect public health from cyanotoxin exposure. Sites are evaluated via desktop and visual monitoring in the field to determine where HAB monitoring resources will be deployed. Desktop evaluations of satellite imagery

will be completed by BWQP. The satellite tool reports daily and weekly cyanobacteria concentrations in response to the Ocean and Land Color Instruments (OCLI) satellite sensors and displays concentrations on an interactive map desktop application. BWQP will evaluate satellite tool data and communicate findings to any entity participating in HAB monitoring activities including, but not limited to, Nevada Division of State Parks (NDPS), Nevada Office of State Epidemiology (OSE), Nevada Department of Wildlife (NDOW), Nevada Department of Health and Human Services (DHHS), and Nevada Department of Agriculture (NDA) to proceed with appropriate testing, sampling, and health advisory procedures.

The public and participating entities may report suspected HABs to BWQP through the BWQP HABs reporting tool. BWQP will conduct desktop evaluations of reported HABs via submissions and satellite tool data. BWQP will use professional knowledge of HABs to determine the potential and/or severity of a bloom and report these findings across participating entities to proceed with appropriate testing, sampling, and health advisory procedures.

Where feasible, regular visual monitoring will be completed in the field by state personnel. State personnel that may complete visual monitoring in the field include NDEP, NDSP, and NDOW. Visual monitoring includes scanning lake or reservoir shorelines, docks, and other public access areas for the potential presence of a HAB. If there is time and it is safe, it is advised to conduct a visual inspection of the lake or reservoir by either navigating the perimeter of the waterbody by boat, or, if possible, by driving around the lake in a vehicle. If during regular visual monitoring a suspected HAB is observed, it is advised that state personnel take photos of affected water and report findings to NDEP through the HABs reporting tool to proceed with appropriate testing, sampling, and health advisory assessment procedures.

4.0 Site Activities

4.1 Documenting Field Conditions

Field conditions and observations should be documented at the time of sample collection. To prevent incorrect or incomplete information, do not postpone making field notes. Additionally, all photos taken should be documented in the field notes.

If a potential HAB is being documented using the BWQP field data tablets, providing information in all fields will be sufficient for proper data submission. If, however, the BWQP tablets are not being used, the following procedures should be followed.

Field measurements to be recorded should include the following for each sample collected:

- Sampling date & time
- sample location, using GPS where possible, and at a minimum location information that can be converted as accurately as practically feasible into degrees, minutes, seconds, and fractions of seconds of latitude and longitude;
- field-measured water quality parameters, where collected; and
- samplers names and roles.

Station description observations should be noted and may include:

- water level, color and the presence of any visible cyanobacteria or accumulations near the surface;

- the location and extent of surface accumulations;
- any odors that may be associated with cyanobacteria accumulations;
- description of the weather (sunny, percent cloud cover, wind speed, etc);
- evidence of unusual conditions or disturbances (e.g., recent fires, sediment loading);
- changes to water flow conditions (such as those from recent rainfall); and
- the dominant land use and land cover in the area surrounding the sampling locations.

Photo documentation allows later evaluation and comparison over time. At the initial sampling event, or before, establish locations to be used for future photos. Create a photo record of the site by taking photos of the surroundings from several angles to document the area around the sampling site. Capture images of any algal distribution present at the time of sampling by photographing from several angles. These photographs will provide documentation of physical influences and changes that could impact water quality. Note and describe all photos taken in field notes, including time, location, camera, photo ID number, so that photos can later be labeled accordingly. Take photos of any significant factors in the area (e.g., burn areas, erosion). Include an object in photos to show scale.

4.2 Field Activities

The methods described here are designed to be completed in one site visit. Field methods include two levels of HAB monitoring: routine sampling and strategic response sampling. Routine sampling includes visual monitoring and collection of water samples for cyanotoxin and eDNA analyses. Strategic response sampling includes jar test, stick test, and/or water sampling for cyanotoxin and eDNA analyses.

Depending on each sampling location and situation, samplers should wear at a minimum:

1. Gloves, latex or nitrile;
2. Waders, hip boots, or muck boots;
3. If splashing or spray from wind or waves is a concern, eye protection should be worn.

General Sampling precautions:

1. Do not allow the water to come in contact with exposed skin;
2. Do not touch hands to mouth, eyes, or other exposed areas of the body before washing;
3. Avoid contamination of vehicle and common use items (e.g., steering wheel, clipboards, pens);
4. Hands should be washed thoroughly with soap and clean, fresh/potable water immediately after sampling;
5. Remove any rings, watches or other jewelry that might have been exposed to algae contaminated water and wash skin surface area and items;
6. All equipment, gloves, and waders should be rinsed with clean water (not lake water) after sampling and before storage;
7. Used disposable gloves should be removed to avoid contamination;
8. Do not inhale spray from boats, wind, other water surface disturbances or irrigation water from areas with harmful algal blooms; and
9. Do not ingest affected water.

Different species of algae can produce different toxins such as neurotoxins, liver toxins, and skin irritants. It is important that field staff can recognize exposure indicators associated with algal blooms and report

to their supervisors if they begin to experience potential symptoms and seek medical care if needed. Symptoms can occur immediately or within days of exposure. Those symptoms can include:

1. Skin irritation – visible rash, hives, or blisters.
2. Respiratory problems – runny eyes and nose, sore throat, headache, and asthma-like symptoms.
3. Kidney toxicity – acute, severe gastroenteritis (including diarrhea and vomiting).
4. Liver toxicity – abdominal pain, diarrhea, and vomiting, may take hours or days for symptoms to appear in humans.
5. Neurotoxicity – numb lips, tingling fingers and toes, or dizziness, often appear within 15 to 20 minutes of exposure.

4.3 Clean Sampling Procedures

Sampling protocols require the use of clean sampling procedures. These sampling procedures help to reduce (to the extent feasible given current resources) the amount of contamination introduced when collecting water-quality samples in the field. “Clean” sampling procedures involve (1) using equipment that is constructed of non-contaminating materials and that has been cleaned rigorously before field work and between field sites; (2) handling equipment in a manner that minimizes contamination; (3) collecting, processing, and handling samples in a manner that prevents contamination; and (4) routinely collecting quality-control (QC) samples.

4.4 Sample Location

When feasible, routine HAB sampling will be conducted by BWQP. If collecting cyanobacteria samples as part of a routine lake monitoring sampling event, samples will be collected at the index point where routine sampling is occurring. If there is time and it is safe, time may be taken to conduct a visual inspection of the lake or reservoir by either navigating the perimeter of the waterbody by boat, or, if possible, by driving around the lake in a vehicle. If a potential bloom is observed, another cyanobacteria sample may be collected from the densest portion of the bloom following the sample collection protocols and findings will be communicated with OSE, DHHS, NDSP, NDOW, and NDA.

If responding to a report of a potential bloom, attempt to conduct a visual inspection of the area where the bloom was observed. If a potential bloom is observed, you may begin with a jar and stick test to confirm whether the bloom is likely to be harmful. Proceed to the jar test and stick test methods within the densest portion of the bloom. If the jar test and/or stick test confirms a HAB is likely present, upon recommendation from NDEP, a cyanobacteria sample may be collected from the densest portion of the bloom following sample collection protocols below. If no bloom is visible, time should be taken to conduct a visual inspection of the lake or reservoir by either navigating the perimeter of the waterbody by boat, or, if possible, by driving around the lake in a vehicle. If after a thorough visual inspection no bloom is visible, collect samples at a point of high recreational use, such as a boat ramp, beach, or dock. Cyanotoxins can be present in water during low density blooms that do not produce scum or after bloom material has decayed.

A site ID should be printed on the sample container and on the chain of custody form (Section 5.2). If samples are being collected at a predetermined index point, use the Site ID assigned by NDEP. If samples are being collected at targeted locations, or otherwise being collected at non-predetermined index

points, the following naming convention should be applied to each sample consecutively: waterbody-name_1; waterbody-name_2, etc. (Ex. Lahontan_1; Lahontan_2; etc.)

4.5 Visual Assessment

Cyanobacteria typically have a distinct appearance that can make visual assessment a useful method for HAB surveillance. See Attachment 1 for images and descriptions of the different visual forms HABs can take.

A visual assessment will be performed routinely by trained personnel and/or upon initial reporting of a suspected HAB. When conducting a visual assessment, the following characteristics are used:

It is NOT cyanobacteria if:

- You can see leaf-like structures or roots;
- The material is long and stringy, or can be lifted out of the water on a stick;
- If it is firmly attached to plants, rock, or the bottom (e.g. you can't lift it out).

It MAY be potentially hazardous cyanobacteria if:

- The material consists of small particles that are pinhead size or smaller;
- The material is collecting in a layer at the surface or along the shoreline;
- The water is murky and colored a brownish green, milky green, bright green or blue.

4.6 Field Test Methods

Jar Test

A. With gloves on, fill any clear jar with a screw top lid with water from just below the surface. Fill the jar to about three-quarters full.
B. Wipe any scum off the outside of the jar and screw the lid on.
C. Clearly label the jar with waterbody, date, and time collected.
D. Allow the jar to stand in a sunny place for approximately 15 to 30 minutes;
E. If the algae have formed a green ring at the top of the water, it is likely that a harmful algal bloom is present.

Stick Test

If a mat of algae is floating on the surface of a water body:

A. Using a sturdy stick (long enough to reach into the water without the water contacting bare skin) push into the surface mat and slowly lift the stick out of the water.
B. If the stick comes out looking as if it were dipped into a can of paint, it is likely that a harmful algal bloom is present.
C. If the stick comes out with green strands, the material is likely filamentous green algae, which may be a nuisance but is likely not a health hazard.

4.7 Sample Collection

To avoid disturbing the water at each sampling location; shoreline and river grab samples should be obtained prior to other activities that would disturb the water.

Water samples for public health assessment should be collected as grab samples, using the same sampling protocol at all locations, to maximize consistency of samples collected. The grab sampling technique described below is recommended for the purpose of public health assessments; use of this approach will provide comparable and consistent sampling techniques for samples collected by various monitoring entities.

For grab samples collected by hand-held methods, the sampler should boat or wade to where the sample will be collected (Section 4.4), and that sample should be collected before other work is done at that location to minimize collection from a disturbed water column. **Care must be taken to avoid collecting particulates that are re-suspended as the result of accessing the sampling location**.

Using the protocol described below, collect a grab sample from the upper 4-6 inches of the water column. The sample collection depth should be noted on the sample container and in the field notes.

Grab Sample for Cyanotoxin and eDNA Analysis

A. Use clean amber glass bottles – 40 mL for cyanotoxin sample, and 250 mL for eDNA sample (See Attachment 2 for a sampling supplies checklist).

B. Open bottle. Tip the opening of the bottle towards the water (at approximately a 45 angle) and slowly break the water surface and begin to dip bottle into the water. Turn the sampling container so that the bottom side of bottle is below and horizontal to the surface. In other words, the bottle will fully enter the water, but the top rim and side will not go below the surface (see figure). If collecting from a boat, angle the mouth of the sampler container away from the boat. If in flowing water, when turning the bottle upright, turn it so that the opening faces upstream. The sampling bottle should not be moved along the surface to fill. If present, include any surface scum in the sample collection.

C. Tilt the full bottle upright as it is slowly removed.

D. Carefully raise the full bottle from the water.

E. The cyanotoxin bottle should only be filled halfway. The eDNA bottle should be filled to the shoulder. Remove water from the sample bottles to achieve these volumes.

F. Clearly label the sample bottles so that each sample is uniquely identified. A waterproof adhesive label and indelible pen (Sharpie) should be used may be used. At minimum, bottles should be labeled with:
    a. Date collected;
    b. If known, an index site ID, otherwise, the waterbody name;
    c. If more than one site on a waterbody is sampled on the same day, append waterbody name with a hyphen and sequential numbering (e.g. Lahontan-1, Lanontan-2, …)

G. Promptly place the labeled cyanotoxin and eDNA sample bottles in a cooler with ice to minimize exposure to light and begin chilling the samples. (See Post-Sampling Procedures below)

5.0 Post-Sampling Procedures

5.1 Decontamination of Sampling Equipment and Supplies

- After exiting the waterbody, immediately remove any personal gear that came in contact with water. Make sure the wetted personal gear and sampling equipment does not come in contact with other equipment.
- Thoroughly inspect the wetted personal gear and sampling equipment.
- Before leaving the sample site area, remove conspicuous mud, debris, and plant material from wetted personal gear and sampling equipment using a stiff-bristled brush. If any material is removed, either throw it in a trashcan or dispose of it on high, dry ground. Do not put it back into the waterbody or along the waterline.
- If equipment will not be put into immediate use it can be placed out to air-dry in a low-humidity environment for at least 72-hours after all mud and debris has been removed. All surfaces of air-dried equipment should remain free of surface contact, allowing for maximum airflow across all surfaces. Drying is the preferred treatment.
- Alternatively, if gear will be used immediately following sampling, thoroughly spray all wetted personal gear and sampling equipment with 5% bleach solution, white vinegar, or other approved decontamination solution.
- Re-inspect the personal gear and sampling equipment for attached organisms or propagules, making sure to examine all crevices. If necessary, use a stiff bristled brush to remove any remaining debris and mud.
- After re-inspection, spray the personal gear and sampling equipment with clean rinse water. DO NOT USE WATER FROM THE INFECTED SOURCE. This may reintroduce invasive species to the personal gear and sampling equipment.
- After personal gear and sampling equipment are decontaminated, ensure that they remain clean when leaving the site.

5.2 Sample Handling, Chain of Custody, and Shipping Requirements

Sample Handling

Immediately upon collection, water samples should be chilled (on ice or refrigerated) and kept in the dark (e.g., closed cooler) until shipped and throughout shipping.

Once samples have been collected and labels completed,

- Place sample container in a zip-lock bag and seal; this prevents shipping ice from rendering sample label un-readable.
- Promptly place the bag with sample container in a cooler with bagged wet ice or blue ice, to both protect from sunlight, and chill, until shipped. **Samples should be maintained at or below a maximum temperature of 4°C**. Block ice is discouraged to protect sample bottles from breaking during shipping.
- Replenish ice supply as often as needed to maintain samples at or below 4° C. Refresh ice supply prior to shipping sample coolers to NDEP.

Chain of Custody (COC)

The COC (Attachment 3) should be filled out by the collector and included with the shipment of cyanotoxin samples. If samples are frozen prior to shipping, the chain of custody should clearly state that samples were frozen. All samples collected in the field require Chain of Custody (COC). Chain-of-custody (COC) sheets will serve to document the handling of the samples from the time of collection through the time of laboratory analysis.

After collection, samples are in the custody of the sampling team; the COC forms should clearly document all the samples collected during that sampling day, associated sample identification name/numbers, the samplers' names, and the date and time of collection for each sample. The COC form may be completed at the end of the day when sampling is finished. The COC form is shipped with the samples (in the cooler) to the analytical laboratory.

Custody is transferred when coolers are accepted by the shipper or transferred to a courier. At that point the COC form is signed by the samplers (as surrendering the container) and the recipients (either the receiving laboratory or the courier, where the bill of lading serves as COC transfer until received by the laboratory). **Appropriate sample documentation should be placed in a separate re-sealable plastic bag and attached to the inside lid of the shipping cooler**.

Shipping

Samples are typically placed in a cooler, with sufficient double-bagged wet ice or blue ice to maintain samples at ≤ 6° C and shipped using priority overnight mail to arrive at the analyzing laboratory or NDEP the next morning. Whenever possible, samples should be shipped on the same day they are collected. Every effort must be made to deliver samples to the designated certified independent analytical laboratory within a reasonable amount of time to make necessary health advisory decisions. However, due to the remoteness of many of the lakes and reservoirs throughout Nevada, delivery time to the analytical laboratory may vary.

Samples must be shipped within 2 days, or hand delivered to NDEP Bureau of Water Quality Planning within 5 days of sampling to ensure that there is sufficient time to analyze them within the holding time. Shipped samples should be scheduled to be delivered Monday-Friday. Samples should not be shipped on Fridays.

If shipping samples directly to NDEP Bureau of Water Quality planning please ship to BWQP HABs at 901 S. Stewart Street, Suite 4001 Carson City, NV 89701.

6.0 Sample Analysis

6.1 eDNA Analysis

If taxonomic enumeration is required, eDNA samples should be submitted to a laboratory for ELISA analysis following their respective handling and shipping protocols. Samples for ELISA analysis may be shipped to Bend Genetics in Sacramento, CA however there other laboratories that conduct ELISA analysis that agency representatives may use.

6.2 LightDeck-Mini

The LightDeck-Mini will be used for toxin analysis of Cylindrospermopsin and Microcystin. See manufacturer's documentation for operating procedures.

Dilutions for LightDeck-Mini Analysis

Due to the narrow analytical window of the LightDeck Mini, and since we are interested in analyzing for a wide range of concentrations, sample dilution may be necessary. If after running the initial analysis on the LightDeck Mini the result is above the maximum detection limit, a dilution will be needed. This process will continue until either the result is within the analytical window of the Lighdeck Mini, or the result is above the threshold value for an advisory level of **DANGER**. The analytical window can fluctuate due to temperature and other factors, so staff running the analysis will need to review the results to determine if they exceed the maximum detection limit.

If the microcystin results are above the maximum detection limit, dilution(s) will need to be carried out until the result is within the detection window (**Table 1**). If after the third dilution the result is still above the maximum detection limit, the actual toxin concentration is above the threshold for the recreational advisory level of **DANGER**, and no further dilutions are needed. The dilutions may be carried out as follows:

Table 1. Dilution table for Microcystin

Dilution	Amount Sample	Amount DI Water	Dilution Multiplier
First	10 µL	70 µL	8
Second	10 µL	560 µL	57
Third	10 µL	4.48 mL	449

If the cylindrospermopsin results are above the maximum detection limit, dilution(s) will need to be carried out until the result is within the detection window (**Table 2**). If after the second dilution the result is still above the maximum detection limit, the actual concentration is above the threshold for the recreational advisory level of **DANGER**, and no further dilutions are needed. The dilutions may be carried out as follows:

Table 2. Dilution table for Cylindrospermopsin

Dilution	Amount Sample	Amount DI Water	Dilution Multiplier
First	10 µL	30 µL	4
Second	10 µL	150 µL	16

After dilutions have been completed, multiply the resultant concentration by the dilution multiplier to find the actual concentration of toxin. Record the dilution factor in the analysis notes of the Lightdeck Mini as well as in the notes for the results imported into the database.

Table 3. HACH LightDeck-Mini Detection Limits

Analyte	Minimum Detection Limit	Maximum Detection Limit
Microcystin	0.5 µL	5 µL
Cylindrospermopsin	0.7 µL	3 µL

Attachment 1

Harmful Algal Bloom Guide

These images highlight the range of colors and textures of cyanobacteria when accumulating on the water surface and near shorelines, and other types of floating plants that can be distinguished from cyanobacteria blooms by color and texture.

- Figures 1-4 show common *Microcystis* species. When *Microcystis* blooms are observed at low abundance (figs 15;p 13), the material can appear like small flakes of lettuce, while at higher abundance, this same genera can look like floating paint (fig 18;p 14).
- Figures 5-8 show a close-up of *Dolichospermum* (*Anabeana*) and the range of green shades the material can appear as in the field.
- Figure 9 shows *Aphanizomenon flos-aquae*; the filamentous material appears like short grass clippings that can grow from individual filaments into dense, clumpy blooms.
- Figure 10 shows *Woronichinia*; its material can appear gelatinous and ranges from blue-green to brown-green.
- Figures 11-13 show how mixed cyanobacteria blooms can appear in contrast to blooms characterized from a single dominant genera.
- Figures 14-16 shows green algae species that can be mistaken for a cyanboacteria bloom. Green algae is a non-toxic algae that is typically grass-green color and often consist of filamentous material.
- Figures 17-18 shows *Wolffia columbiana* (or Duckweed); this floating plant may be mistaken as algae but with closer inspection can identify individual plants.
- Figures 19-20 shows rooted macrophytes (aquatic plants).

Figure 1. *Microcystis aeruginosa* detail (Photograph: Ann St. Amand; Rosen et al., 2015)

Figure 2. *Microcystis aeruginosa* (Photograph: Ann St. Amand; Rosen et al., 2015)

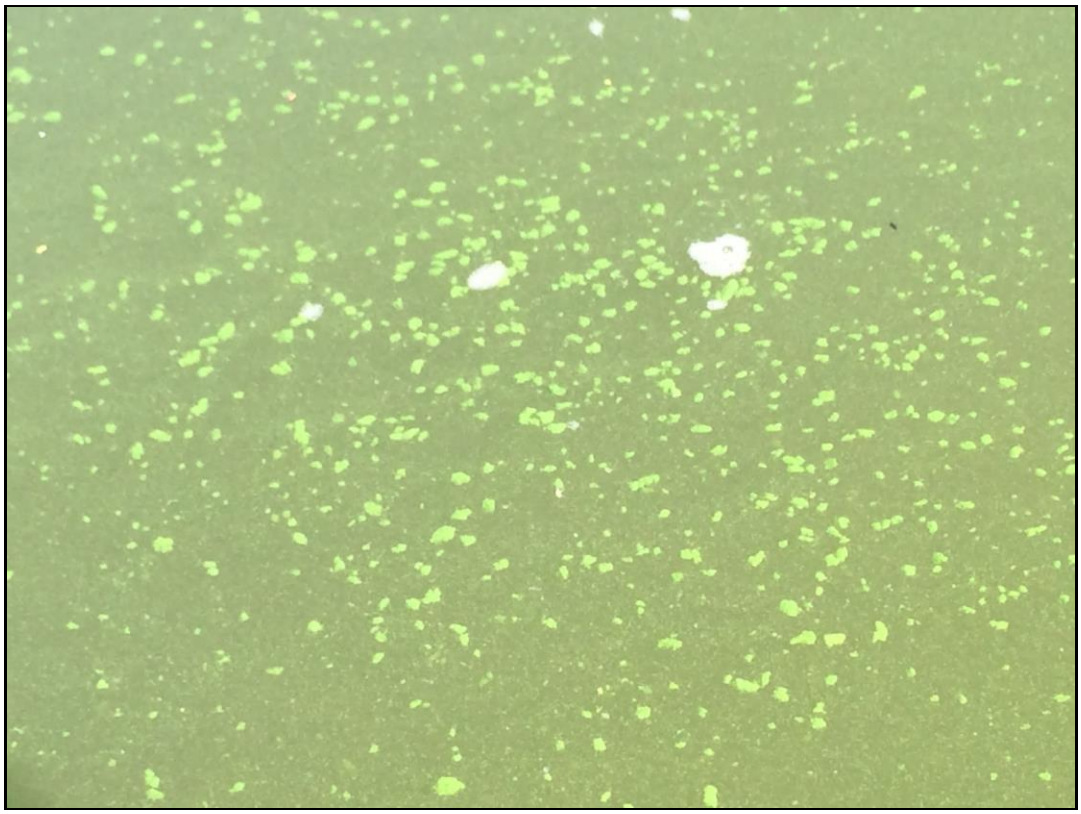


Figure 3. *Microcystis sp.* floating colonies (Photograph: SWAMP)

Figure 4. *Microcystis sp.* (Photograph: Jacob Kann)

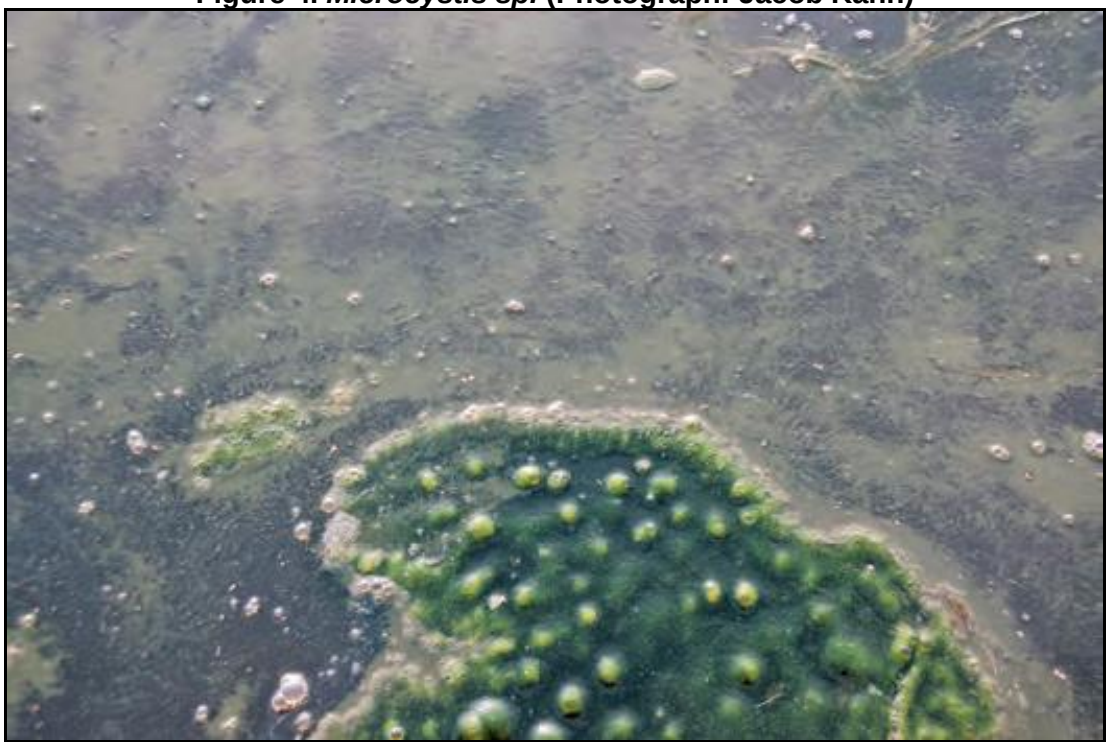


Figure 5. *Dolichospermum lemmermannii* (Photograph: Ann St. Amand; Rosen et al., 2015)

Figure 6. *Dolichospermum lemmermannii* (Photograph: Ann St. Amand; Rosen et al., 2015)

Figure 7. *Dolichospermum lemmermannii* (Photograph: Ann St. Amand; Rosen et al., 2015)

Figure 8. *Dolichospermum mendotae* (Photograph: Ann St. Amand; Rosen et al., 2015)

Figure 9. *Aphanizomenon flos-aquae* (Photograph: Jacob Kann; Rosen et al., 2015)

Figure 10. *Woronichinia naegeliana* (Photograph: Ann St. Amand; Rosen et al., 2015)

Figure 11. Mixed genera CyanoHAB, slow moving channel (Photograph: SWAMP)

Figure 12. Mixed genera CyanoHAB, lake (Photograph: SCCWRP)

Figure 13. Mixed genera CyanoHAB, lake shoreline (Photograph: SCCWRP)

Figure 14. Green algae, *Mougeotia sp.* (Photograph: Steve Heiskary, Minnesota Pollution Control Agency)

Figure 15. Green algae, *Spirogyra sp.* (Photograph: Ken Wagner)

Figure 16. Green algae, *Mougeotia sp.* (Photograph: Steve Heiskary, Minnesota Pollution Control Agency)

Figure 17. Duckweed: *Wolffia Columbiana* (also called watermeal). (Photograph: Ann St. Amand)

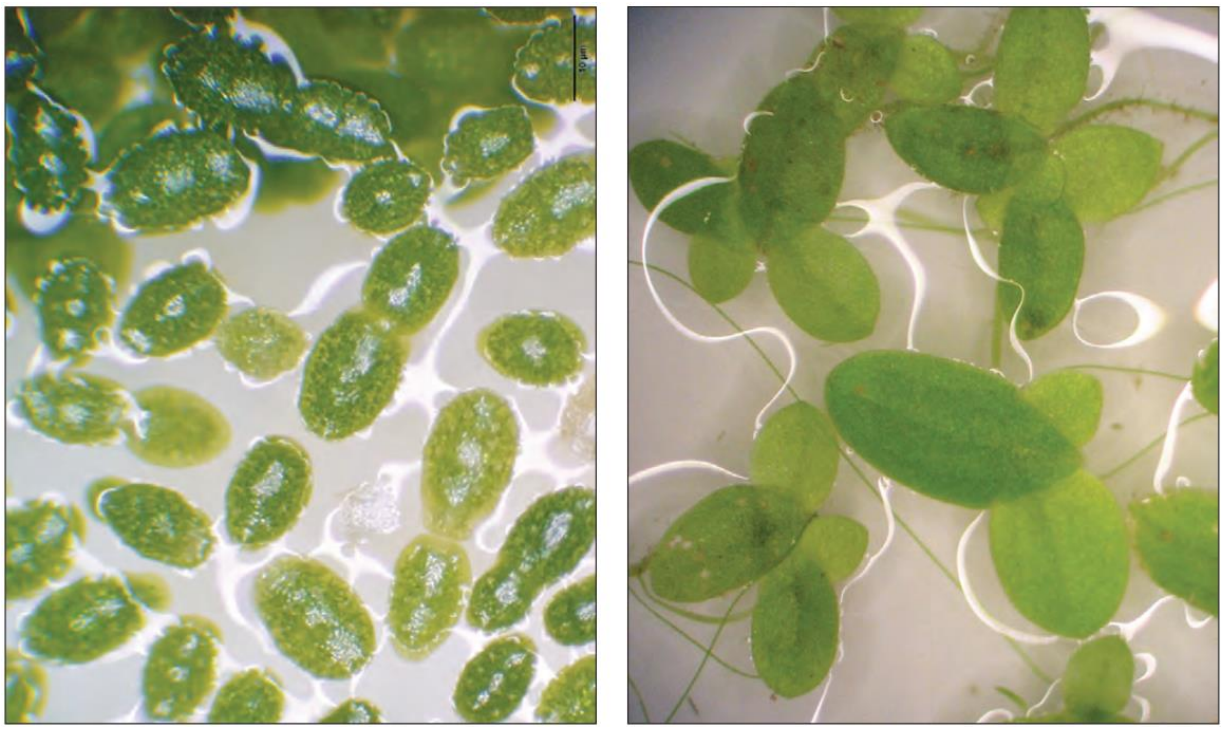


Figure 18. Duckweed: Left, *Wolffia Columbiana;* Right: *Lemna minor* (Photographs: Barry H. Rosen)

Figure 19. Charophyta, *Chara sp.* (Photograph: Barry H. Rosen)

Figure 20. Rooted macrophytes. (Photograph: Ann St. Amand)

Attachment 2 HABs

Sampling Checklist

HABs Sampling Checklist

Paperwork:	Bottle Set per Site:
☐ Clipboard ☐ Sample labels ☐ Lab Chain of Custody form ☐ Pencils/Pens/Sharpies ☐ GPS device or Cell phone for coordinates	☐ Amber glass bottles (provided by NDEP) ☐ Take a bottle set for each site + 1 ☐ Bottle sets go in ice chests, leave room for ice

Equipment:	Field Box:
☐ Coolers with ice ☐ Waders/Boots ☐ Boat (if applicable) ☐ Anchor ☐ Paddles ☐ Personal floatation devices	☐ Nitrile gloves ☐ Eye protection ☐ Portable eyewash bottle ☐ Paper towels

Attachment 3

Chain of Custody

2024 Harmful Algal Bloom Chain of Custody	**Agency:**
Nevada Division of Environmental Protection, Bureau of Water Quality Planning	Address:
Weston Fettgather, Bioassessment Branch Supervisor (wfettgather@ndep.nv.gov)	
901 S Stewart Street, Suite 4001 Carson City, NV 89701	Contact:
775-687-9453	

StationID	WaterbodyName	County	Lat_Dec	Long_Dec	Date Collected	Number of Jars	Notes

Relinquished by: _____ name _____ signature _____ date

Received by: _____ name _____ signature _____ date

APPENDIX B:

RATIONALE: Nevada's Recreational Risk Thresholds for Cyanobacteria

RATIONALE:
Nevada's Recreational Risk Thresholds for Cyanobacteria

Prepared by:

Nevada Division of Environmental Protection

& Nevada Office of State Epidemiology

April, 2024

Recreational Risk Thresholds

Recreational risk thresholds serve as the basis for the application of recreational advisories, response actions, and allocation of resources. The World Health Organization (WHO) developed a hierarchy of the relative probability of acute health effects to account for the possible exposures through recreational activities (contact, ingestion, and inhalation) during recreational exposure to cyanobacteria (WHO, 2003). Using the WHO's framework, Nevada has developed risk threshold values from several sources described below and applied them to a hierarchy of recreational risk (**Table 1**). Risk levels are categorized into three levels: low, moderate, and high. Each level of risk corresponds to measurable parameters of cyanobacteria or cyanotoxin abundance and indicates the need for particular actions.

Recreational Risk	Possible Health Implications	Possible Actions
Low probability of adverse health effects	Short-term adverse health outcomes, e.g., skin irritations, gastrointestinal illness	-Post on-site risk advisory signs. -Inform relevant authorities. -Post online recreational advisory.
Moderate probability of adverse health effects	Potential for long-term illness with some cyanobacterial species health outcomes, e.g., skin irritations, gastrointestinal illness	-Post on-site risk advisory signs. -Inform relevant authorities. -Post online recreational advisory. -Issue social media release -Consider restricting access
High probability of adverse health effects	Potential for acute poisoning Potential for long-term illness with cyanobacterial species Short-term adverse activities health outcomes, e.g., skin irritations, gastrointestinal illness	Post on-site risk advisory signs. -Inform relevant authorities. -Post online recreational advisory. -Issue social media release -Contact local media -Consider restricting access

Table 1. Nevada's Hierarchy of Risk for Cyanobacteria

Nevada has derived threshold values for three cyanotoxins: microcystin, cylindrospermopsin, and anatoxin-a. Microcystin and Cylindrospermopsin have been subject to extensive research and have established methodologies for analysis. Risk threshold values for microcystin and cylindropspermopsin are based on a combination of guidance from the US Environmental Protection Agency (EPA) and the WHO. Although Anatoxin-a has been the subject of a smaller body of research, the neurotoxicological effects are of such concern that, to adequately protect the health of the public, recreational risk thresholds have been developed based on toxicological studies conducted in California and Oregon. Below are descriptions of the studies and methodologies on which Nevada's risk thresholds are based.

EPA

EPA issued guidance documentation specifying recreational risk thresholds for the issuance of recreational advisories in 2019. The documentation included recreational risk values for microcystin and cylindrospermopsin (EPA, 2019) (**Table 2)**. EPA's study design for microcystin and cylindrospermopsin provide the health effects basis for development of oral toxicity values that are used as the measure of effect for oral exposure through incidental ingestion while recreating. The results are based on short-term and subchronic studies and therefore are an estimate (with uncertainties spanning perhaps an order of magnitude) of the daily exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a short-term exposure period.

Table 2. EPA Swimming Advisory Recommendations for Microcystins and Cylindrospermopsin, 2019

Microcystins Magnitude (µg/L)	Cylindrospermopsin Magnitude (µg/L)	Exceedance Threshold
8	15	Not to be exceeded

The EPA selected incidental ingestion during primary contact activities (such as swimming) in derivation of the swimming advisory values because data suggest that incidental ingestion can be considered the highest potential exposure pathway for cyanotoxins while recreating. EPA cited studies of incidental ingestion during recreation indicate that the odds of ingesting a teaspoon or more of water are significantly higher among swimmers than among those who just immersed their head in a swimming pool or those who participated in the other, more limited contact activities on surface waters. Therefore, the EPA determined that using a swimmer scenario for exposure as the basis for the criteria is protective of these other aquatic activities.

WHO

The WHO issued guidance documentation for recreational risk thresholds for cyanobacteria cell concentration and microcystin concentration in 2003 (**Table 3**). For protection from health outcomes not due to cyanotoxin toxicity, but rather to the irritative or allergenic effects of other cyanobacterial compounds, the WHO issued a guideline level of 20,000 cyanobacterial cells/ml (corresponding to 10mg chlorophyll-a/litre under conditions of cyanobacterial dominance), derived from the prospective epidemiological study by Pilotto et al. (1997) (WHO, 2003). Whereas the health outcomes reported in this study were related to cyanobacterial density and duration of exposure, they affected less than 30% of the individuals exposed. At this cyanobacterial density, 2–4mg microcystin/litre may be expected if microcystin-producing cyanobacteria are dominant, with 10mg/litre being possible with highly toxic blooms. Thus, health outcomes due to microcystin are unlikely.

Relative Probability of Acute Health Effects	Cyanobacteria (cells/mL)	Chlorophyll *a* (µg/L)	Estimated Microcystin Levels (µg/L)
Low	< 20,000	< 10	< 10
Moderate	20,000–100,000	10–50	10–20
High	>100,000–10,000,000	50–5,000	20–2,000
Very High	> 10,000,000	> 5,000	> 2,000

Table 3. WHO Recreational Action Levels for Cyanobacteria, Chlorophyll *a,* and Microcystin, 2003

The WHO microcystin recreational thresholds for high risk are based on calculations of incidental ingestion by a child recreating in dense cyanobacteria scum. Calculations suggest that a child playing in *Microcystis* scum for a protracted period and ingesting a significant volume could receive a lethal dose, although no reports indicate that this has occurred (WHO, 2003). Based on evidence that a lethal oral dose of microcystin-LR (the most toxic compound of the microcystin family of toxins) in mice is 5000–11,600mg/kg body weight and sensitivity between individuals may vary approximately 10-fold, the ingestion of 5–50 mg of microcystin could be expected to cause acute liver injury in a 10-kg child. Concentrations of up to 24 mg/liter microcystin from scum material have been published. Based on this data, the WHO recommended values for high to very-high risk exposure to microcystin represents a conservative approach to protecting vulnerable populations. Uncertainty factors were accounted for during extrapolation from mouse to human, differing sensitivities within humans, and for an incomplete toxicological database.

California Office of Environmental Health Hazard Assessment

The California Office of Environmental Health Hazard Assessment (OEHHA) conducted toxicological studies to guide the state's development of recreational risk values for cylindropspermopsin (**Table 4**). OEHHA's recommended upper level of risk for cylindrospermpsin is based on a benchmark dose (BMDL) study in mice conducted by Humpage and Falconer (2003) (OEHHA, 2016). The endpoint was increased kidney weight, indicating mild impaired kidney function. The exposure scenario is a child swimming in recreational waters for 2 hours per day (30.25 kg child ingesting 0.05 L water per hour, or 0.1 L per day). OEHHA's high risk threshold value is health-based and conservative.

Basis of Trigger	Trigger (µg/L)	Study
Risk Management: *Precautionary Approach*	1	--
OEHHA's Action Level	4	Humpage and Falconer (2003)
Modified OEHHA Action Level	17	Humpage and Falconer (2003)

Table 4. OEHHA Action Levels for Cylindrospermopsin, 2016

OEHHA also conducted toxicological studies to guide the state's development of recreational risk values for anatoxin-a (**Table 5**). OEHHA's recommended threshold for low risk is based on Oregon's recreational risk guidelines by Farrer et al. (2015) (OEHHA, 2016). The study looked at short term oral exposure in mice done by Fawell et al. (1999b). The mice were examined for a wide range of toxicological endpoints both during and at the end of the study. There was no statistically

significant difference between the control group and any of the dosed groups for any of these endpoints. However, there were two unexplained deaths in the study -- one each in the mid- and high-dose groups. Anatoxin-a was not suspected in these deaths, but it was not possible to rule it out. Therefore, OEHHA set the lowest dose, as the No-Observed Adverse Effect level. The exposure scenario was a child swimming in recreational waters for 2 hours per day (20 kg child ingesting 0.05 L water per hour, or 0.1 L per day).

Basis of Trigger	Trigger (µg/L)	Study
Risk Management: *Precautionary Approach*	Detect	--
Risk Management: *OEHHA's Guideline*	20	Fawell et al., 1999b
OEHHA's Action Level	90	Fawell et al., 1999b

Table 5. OEHHA Action Levels for Anatoxin-a, 2016

OEHHA's recommended anatoxin-a threshold for high risk was also based on the short-term oral study in mice by Fawell et al., (1999b) (**Table 5**). As described above, there was no statistically significant difference between the control group and any of the dosed groups for a wide array of endpoints. OEHHA did not consider the two unexplained mortalities described above to be treatment related. The mice in this study were exposed daily through oral gavage, which is a somewhat stressful technique that can lead to unintended mortalities. OEHHA identified the highest dose as the highest risk level. The exposure scenario included a child swimming in recreational waters for 5 hours per day (30.25 kg child ingesting 0.05 L water per hour, or 0.25 L per day). OEHHA also considered exposures through inhalation and skin contact.

Nevada Recreational Risk Thresholds for Cyanobacteria

Based on the above toxicological studies, and with the intent of developing a hierarchy of risk based on recreational contact with varying concentrations of cyanobacteria and their toxins, **Table 6** describes Nevada's recreational risk thresholds for cyanobacteria. The thresholds align with the hierarchy of risk described in **Table 1**. Overall risk level will be dictated by the highest risk associated with any single analyte.

Table 6. Nevada Recreational Risk Thresholds for CyanobacteriaAnalyte	Low Risk	Moderate Risk	High Risk
Microcystin (µg/L)	>4 and ≤8	>8 and ≤2,000	>2,000
Cylindrospermopsin (µg/L)	>8 and ≤15	>15 and ≤17	>17
Anatoxin-a (µg/L)	>Reporting Limit and ≤20	>20 and ≤90	>90

Cyanobacteria (cells/mL)	20,000	NA	NA

Microcystin Recreational Risk Thresholds

Based upon EPA studies (2019), a threshold value of 8 µg/L for microcystin will serve as Nevada's threshold for moderate probability of adverse health effects from recreational exposure. Concentrations above the detection limit but below this threshold value still have the potential to have a relatively low recreational risk on human health and may be appropriate to recommend caution with recreational contact. Concentrations detected above this threshold value will be considered as a moderate recreational risk and appropriate actions to protect public health will be recommended.

Based upon WHO studies (2003), a threshold value of 2,000 µg/L for microcystins will serve as Nevada's threshold for high probability of acute health effects from recreational exposure. Microcystin concentrations detected above this threshold value will be considered as a high recreational risk, and the highest level of precautions will be recommended to protect human health.

Cylindrospermopsin Recreational Risk Thresholds

Based upon EPA studies (2019), a threshold value of 15 µg/L for cylindrospermopsin will serve as Nevada's threshold for moderate probability of adverse health effects from recreational exposure. Concentrations above the detection limit but below this threshold value still have the potential to have a relatively low recreational risk on human health and may be appropriate to recommend caution with recreational contact. Concentrations detected above this threshold value will be considered as a moderate recreational risk and appropriate actions to protect public health will be recommended.

Based upon OEHHA studies (2016), a threshold value of 17 µg/L for cylindropsermopsin will serve as Nevada's threshold for high probability of acute health effects from recreational exposure. Microcystin concentrations detected above this threshold value will be considered as a high recreational risk, and the highest level of precautions will be recommended to protect human health.

Anatoxin-a Recreational Risk Thresholds

Based upon OEHHA studies (2016), a threshold value of 20 µg/L for anatoxin-a will serve as Nevada's threshold for moderate probability of adverse health effects from recreational exposure. Concentrations above the detection limit but below this threshold value still have the potential to have a relatively low recreational risk on human health and may be appropriate to recommend caution with recreational contact. Concentrations detected above this threshold value will be considered as a moderate recreational risk and appropriate actions to protect public health will be recommended.

Based upon OEHHA studies (2016), a threshold value of 90 µg/L for anatoxin-a will serve as Nevada's threshold for high probability of acute health effects from recreational exposure. Microcystin concentrations detected above this threshold value will be considered as a high recreational risk, and the highest level of precautions will be recommended to protect human health.

Cyanobacteria Concentration Recreational Risk Thresholds

A threshold value for cyanobacteria concentrations of 20,000 cells/mL will act as Nevada's low recreational risk threshold for cyanobacteria concentration in a waterbody. This value is based on the WHO's risk thresholds (**Table 4**).

Sources

EPA. *Recommended Human Health Recreational Ambient Water Quality Criteria or Swimming Advisories for Microcystins and Cylindrospermopsin*. 2019.

Fawell, J K, et al. "The Toxicity of Cyanobacterial Toxins in the Mouse: II Anatoxin-a." *Human & Experimental Toxicology*, vol. 18, no. 3, Mar. 1999, pp. 168–173, https://doi.org/10.1177/096032719901800306. Accessed 10 Nov. 2021.

Humpage, A. R., and I. R. Falconer. "Oral Toxicity of the Cyanobacterial Toxin Cylindrospermopsin in Male Swiss Albino Mice: Determination of No Observed Adverse Effect Level for Deriving a Drinking Water Guideline Value." *Environmental Toxicology*, vol. 18, no. 2, 2003, pp. 94–103, https://doi.org/10.1002/tox.10104.

Office of Environmental Health Hazard Assessment California Environmental Protection Agency. *TOXICOLOGICAL SUMMARY and SUGGESTED ACTION LEVELS to REDUCE POTENTIAL ADVERSE HEALTH EFFECTS of SIX CYANOTOXINS*. 2012.

Rogers, Ellen H, et al. "Potential Developmental Toxicity of Anatoxin-a, a Cyanobacterial Toxin." *J Appl Toxicol*, vol. 25, no. 6, 1 Nov. 2005, pp. 527–534, https://doi.org/10.1002/jat.1091. Accessed 22 May 2023.

State of California. *Appendix to the CCHAB Preliminary Changes to the Statewide Voluntary Guidance on CyanoHABs in Recreational Waters*. 2016.

WHO. *Guidelines for Safe Recreational Water Environments VOLUME 1 COASTAL and FRESH WATERS*. 2003.

---. *GUIDELINES on RECREATIONAL WATER QUALITY Volume 1 Coastal and Fresh Waters*. 2021.

APPENDIX C:
HAB ADVISORY SIGNS

HAB WATCH

Harmful Algae May be Present

Blue-Green Algae May be Harmful to Humans & Animals

Swimming, wading, and jet skiing are discouraged near visible blooms.

Keep pets & livestock away from water.

Report harmful algal blooms to Nevada Division of Environmental Protection at: 1-888-331-6337

Report possible algal bloom related illness to Nevada Department of Health and Human Services at: 1-775-684-5911

- **Use caution when contacting lake water and wash with clean, potable water afterward**
- **Avoid areas of algae accumulation**
- **Do not let people or pets eat dried algae or drink untreated water**

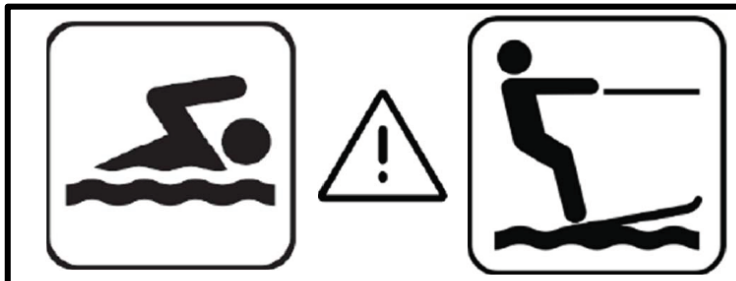
In case of contact with harmful algae: Call a doctor or veterinarian if people or animals have nausea, vomiting, diarrhea, rash, irritated eyes, seizures, breathing problems or other unexplained illness.

For more information: Scan QR code or visit https://ndep.nv.gov/water/rivers-streams-lakes/water-quality-monitoring/harmful-algal-bloom-program

HAB WARNING

Harmful Algae Expected or Present

People & Animals May Get Sick



Swimming, wading, and jet skiing are discouraged near visible blooms.

Keep pets & livestock away from water.

Report harmful algal blooms to Nevada Division of Environmental Protection at: 1-888-331-6337

Report possible algal bloom related illness to Nevada Department of Health and Human Services at: 1-775-684-5911

- **If people or pets contact lake water wash with clean, potable water as soon as possible**
- **Avoid areas of algae accumulation**
- **Do not let people or pets eat dried algae or drink untreated water**

In case of contact with harmful algae: Call a doctor or veterinarian if people or animals have nausea, vomiting, diarrhea, rash, irritated eyes, seizures, breathing problems or other unexplained illness.

For more information: Scan this code or visit https://ndep.nv.gov/water/rivers-streams-lakes/water-quality-monitoring/harmful-algal-bloom-program

HAB DANGER

Harmful Algae Present

Water Contains Hazardous Levels of Cyanotoxins
People & Animals Likely to Get Sick

CONTACT WITH WATER STRONGLY DISCOURAGED

Report harmful algal blooms to Nevada Division of Environmental Protection at: 1-888-331-6337

Report possible algal bloom related illness to Nevada Department of Health and Human Services at: 1-775-684-5911

In case of contact with harmful algae: Call a doctor or veterinarian if people or animals have nausea, vomiting, diarrhea, rash, irritated eyes, seizures, breathing problems or other unexplained illness.

For more information: Scan this code or visit https://ndep.nv.gov/water/rivers-streams-lakes/water-quality-monitoring/harmful-algal-bloom-program

APPENDIX D:
SOCIAL MEDIA ADVISORY TEMPLATES



SOCIAL MEDIA

RECREATIONAL WATER ADVISORY or CLOSURE ISSUED

TWITTER

- "WARNING—Water Contact Might Cause Illness. The water at [location] contains [cyanotoxins *or* cyanobacteria] at levels that could cause harm. Do not swim. For more information, see: [insert website link]"
- "[Location] is closed. The water at [location] contains [cyanotoxins *or* cyanobacteria] at levels that could cause harm. Avoid all contact with the water, scum, foam or algae. For more information, see: [insert website link]"

FACEBOOK

- "WARNING- [cyanotoxins *or* cyanobacteria] have been measured at [location] and could cause harm."
- "[Location] is contaminated with [cyanotoxins *or* cyanobacteria]. Water samples were tested on [dates] for [cyanotoxin *or* cyanobacteria name] and show levels that may cause harm. People, pets and livestock should avoid any contact with the water, scum, foam or algae. For additional information: [insert website link]"

AUTOMATED TEXT MESSAGES

- "Advisory has been posted for [location]. Levels of [cyanotoxins *or* cyanobacteria] at potentially harmful levels. People, pets and livestock should avoid contact with the water. For additional information, please see [website link]."
- "Wireless Emergency Alert message: "[Location] is closed due to [cyanotoxins *or* cyanobacteria] that may harm people, pets or livestock. For additional information, please see [website link] or tune into [radio / TV station]."



SOCIAL MEDIA

RECREATIONAL WATER ADVISORY or CLOSURE LIFTED

TWITTER

- "Beach closure update! The notification of [cyanotoxins *or* cyanobacteria] contamination for [location] has been lifted. For more information, see: [insert website link]"
- "[Testing Agencies name] confirms levels of [cyanotoxins *or* cyanobacteria] at [location] are safe for swimming. [Location] is now open. For more information, see: [insert website link]"

FACEBOOK

- "The notification of [cyanotoxins *or* cyanobacteria] contamination has been lifted for [location]. For more information, see: [insert website link]"
- "[Testing Agencies name] confirms levels of [cyanotoxins *or* cyanobacteria] acceptable for all recreation at [location]. [Location] is now open. For more information, see: [insert website link]"

AUTOMATED TEXT MESSAGES

- "Beach closure update! The [location] is now open. For additional information, please see [website link]."
- Wireless Emergency Alert message: "Update! The closure of [location] due to [cyanotoxins *or* cyanobacteria] contamination has been lifted. For more information, see: [insert website link]"

APPENDIX E:
WEEKLY REPORT TEMPLATE

HARMFUL ALGAL BLOOM (HAB) WEEKLY REPORT

Nevada Division of Environmental Protection

Bureau of Water Quality Planning (BWQP)

This document includes the most recent HAB data and health advisory updates for the week of **[xx/xx/2024 through xx/xx/2024].**

Visual confirmation of harmful algal blooms (HABs) occurred at the following water bodies:

- **[water body name]**
- **[water body name]**

Based on these findings the Office of State Epidemiology has issued a Bloom Watch advisory for the above water bodies.

Cyanotoxin concentrations were detected in laboratory analyses at concentrations **exceeding respective recreational threshold advisories**. As such, the Office of State Epidemiology has issued health advisories at the following water bodies:

- **[water body name], [cyanotoxin concentration and cyanotoxin name], [advisory level]**
- **[water body name], [cyanotoxin concentration and cyanotoxin name], [advisory level]**

Cyanotoxin concentrations were detected in laboratory analyses at **concentrations below respective recreational advisory levels**. As such, the Office of State Epidemiology has lifted health advisories and normal recreating may resume at the following water bodies:

- **[water body name], [cyanotoxin concentration and cyanotoxin name]**
- **[water body name], [cyanotoxin concentration and cyanotoxin name]**

For the week of [xx/xx/2024 through xx/xx/2024], the remote sensing tool indicates [state an overall trend if possible].

[insert remote sensing graph or image?]

The HABs monitoring team will continue regular surveillance of impacted water bodies. Sampling and analysis of affected water bodies will occur promptly as resources become available.

For more information regarding the HAB monitoring program, health advisories, exposure information, or to report a suspected HAB visit the BWQP HABs Webpage.

Contact:

NDEP

Weston Fettgather | wfettgather@ndep.nv.gov

Supervisor, Environmental Scientist

Bioassessment Branch, BWQP

NDEP

Veda Parker | vparker@ndep.nv.gov

Environmental Scientist

Bioassessment Branch, BWQP

APPENDIX F:
‘BE ALGAE AWARE’ POSTER

Be Algae Aware

Recognize harmful algal blooms — and learn how to safely enjoy Nevada's rivers and lakes.

If in doubt, STAY OUT

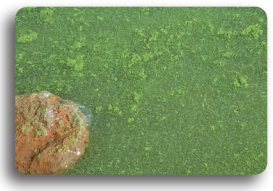
Nevada's rivers and lakes are fun, safe places to play in, but always be on the lookout for evidence of harmful algal blooms. If the conditions are right, naturally occurring algae can rapidly bloom and can produce toxins. Exposure to blooms can make you and your family sick — **and it can even kill pets, livestock, and wildlife.**

Learn what to avoid

Algal blooms can occur at any time of year, but are most common in the summer — when water is warm and stagnant.

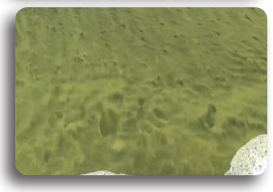
It may be a harmful algal bloom if…

- It **smells** rotten

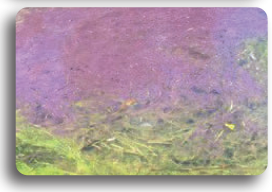


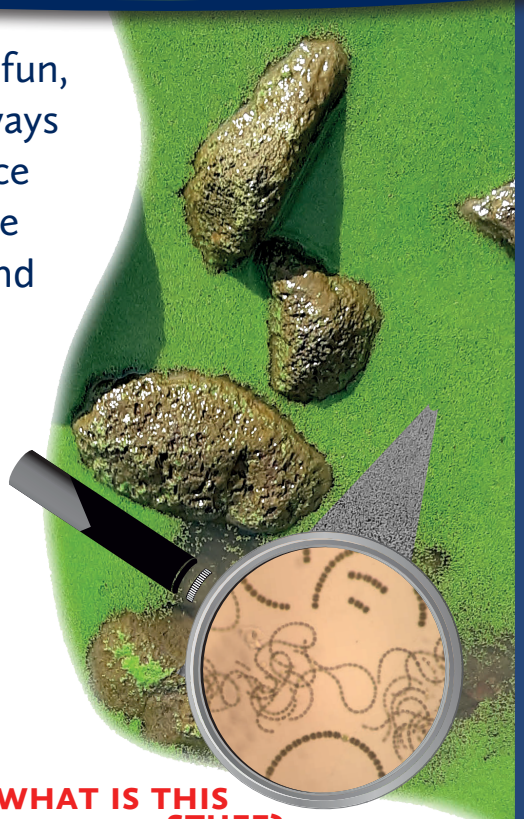
- The water looks like **paint**

- Large **mats** or **scums** are floating on the surface



- There are **bright colors** like blue, green, white, brown, or red

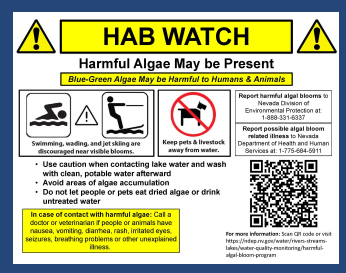


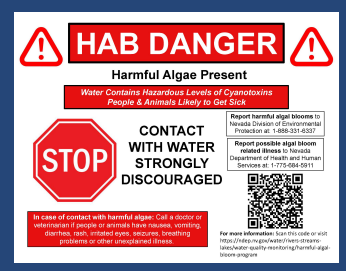


WHAT IS THIS STUFF?

*Toxic algal blooms are not actually algae. They're made of billions of tiny organisms — called **cyanobacteria** — that release toxins when they die.*

LOOK OUT FOR ADVISORY SIGNS!





Know the risks

Exposure to harmful algal blooms can lead to mild or potentially serious health issues. Children, pets, and livestock are especially at risk.

Human Symptoms

Diarrhea, nausea/vomiting, muscle cramps, hives/rashes, trouble breathing, and skin, eye, or throat irritation

Animal Symptoms

Weakness, fatigue, excessive salivation or drooling, staggering, difficulty breathing, vomiting, convulsions, and death

Take precautions

You, your family, and your pets can be exposed to toxic algae by touching, swallowing, or inhaling affected water.

DON'T Play in water with a bloom

DON'T Swim or play in water with a bloom

DON'T Allow pets to play in or drink water during a bloom

DON'T Drink, cook with, or wash dishes with affected water

Scan the QR code

Learn more at: https://ndep.nv.gov/water/rivers-streams-lakes/water-quality-monitoring/harmful-algal-bloom-program

Report harmful algal blooms to Nevada Division of Environmental Protection at:
(888) 331-6337

NDEP · Nevada Department of Wildlife · NDA Nevada Department of Agriculture · Nevada State Parks

APPENDIX G:
HAB RESPONSE FLOWCHART

HAB Response Flowchart