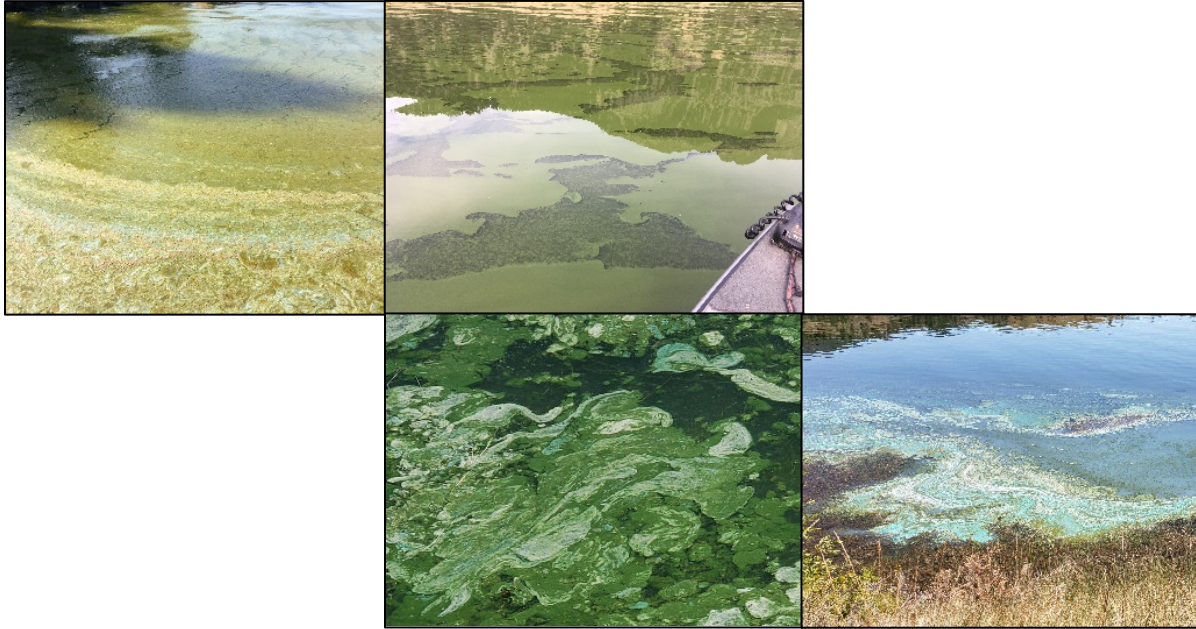


Harmful Algal Bloom (HAB) Guidance Document for Montana



May 2021



**Montana Fish,
Wildlife & Parks**

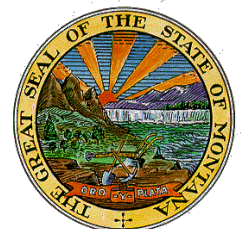


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1.0 INTRODUCTION

The purpose of this document is to provide guidance to local, state, federal, and private landowners to protect people, pets, and livestock from the effects of harmful algal blooms (HABs) in Montana. This guide discusses the general process, factors to consider, and suggestions and recommendations to consider when a waterbody is experiencing a potential HAB. The document provides helpful hyperlinks within the text for more information as well as a HAB contact and resource section.

This guide was developed by the Montana State HAB Team. The HAB Team includes members from the Department of Environmental Quality (DEQ), Department of Public Health and Human Services (DPHHS), and Fish, Wildlife and Parks (FWP). This is not a statewide policy and only serves as recommendations and guidance. The guide is a compilation of information from states and federal agencies that have established HAB guidelines. Other states and organizations that provided information include: Environmental Protection Agency (EPA), Colorado Lake and Reservoir Management Association, Utah Department of Health, Utah Department of Environmental Quality, World Health Organization, California Environmental Protection Agency.

1.1 BACKGROUND

A HAB consists of cyanobacteria, also known as blue-green algae, a common phytoplankton in Montana's waterbodies. Their primary distinction from other algae is that they are prokaryotic (no membrane bound organelles). Cyanobacteria are aquatic, unicellular, and quite small but often grow in colonies large enough to be able to see; they create their own energy from photosynthesis like other eukaryotic phytoplankton.

Cyanobacteria are naturally occurring photosynthetic bacteria found in many habitats (including recreational waters). Potentially toxic blue-green algae occur throughout Montana in any standing bodies of water exposed to the sun, e.g., lakes, reservoirs, stockponds, and roadside ditches. They are not as common in rivers, streams, springs, or irrigation canals. All cyanobacteria can produce toxins (cyanotoxins).

When dense algae populations develop, especially cyanobacteria, they often (though not always) turn the water a greenish or blue-greenish color referred to as a "bloom." Dense blooms near the surface may resemble a layer of spilled paint (**Figure 1**). HABs can occur in a variety of colors, including bright blue, green, white, brown, and red. More than one color may be present. HABs occur when naturally occurring cyanobacteria quickly multiply to high densities and form visible water discoloration, scums, and/or mats. They may also give off a foul odor. They can occur year round but are most common in the summer when abundant sunlight and warm, stagnant water combine with high nutrient levels.

There is no way to determine if a suspected bloom is toxic just by looking at it. Just because there is a cyanobacteria bloom doesn't mean that cyanotoxins are present or being released into the water and, at the other end of the spectrum, cyanotoxins can be present when there is no bloom. It is also easy to mistake growths of green algae for HABs. Visual examples of cyanobacteria and green algae are presented in **Figure 1**.

Figure 1. Potentially toxic cyanobacteria versus nuisance green algae examples

a. Green Algae Example



b. Green Algae Example



c. Blue-Green Algae (Cyanobacteria)



d. Blue-Green Algae (Cyanobacteria)

1.2 CYANOTOXINS

Freshwater cyanotoxins in Montana include microcystins, cylindrospermopsin, and anatoxin-a. While no human deaths caused by direct contact with cyanotoxins have been confirmed in the U.S., they have been known to kill pets, livestock and wildlife. Deaths to pets and livestock by drinking cyanobacterial blooms have been documented in Montana. Exposure to the cells themselves can result in less serious health effects, even when no cyanotoxins are present. Limited cyanotoxin data exists for Montana and cyanobacteria data has only been collected on specific waterbodies. Two species common to Montana--*Aphanizomenon Flos-aquae* and *Microcystis Aeruginosa*-- have produced toxins elsewhere. Common cyanobacteria species are shown in **Figure 2**.

Microcystin are a group of at least 80 toxin variants, microcystin-LR is the most toxic. They are produced by *Microcystis*, *Dolichospermum* (formerly *Anabaena*), *Planktothrix*, *Nostoc*, *Hapalosiphon*, *Anabaenopsis*, and *Snowella Lacustris*. Microcystin is a hepatotoxin, affecting the liver, causing serious acute symptoms and slower chronic symptoms. Symptoms can occur hours or days after being exposed to the cyanotoxin. Signs include abdominal pain, loss of appetite, jaundice, dark or reduced urine, diarrhea, vomiting, liver damage, and hemorrhages.

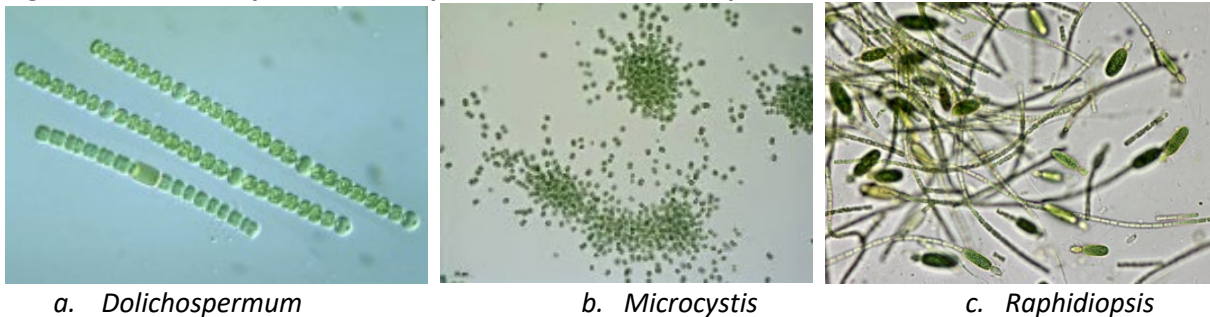
Anatoxin is a neurotoxin produced by several cyanobacterial genera including *Dolichospermum*, *Aphanizomenon*, and *Planktothrix*. Neurotoxins affect the nervous system and can occur very quickly. Signs

can appear within 15 -20 minutes after ingestion. Signs include numbness of the lips, tingling in fingers and toes, stumbling, seizures, paralysis, disorientation, headaches, inactivity, elevated heart rate, dizziness, and respiratory failure.

Cylindrospermopsin is another liver toxin that can be found in *Raphidiopsis* (formerly *Cylindrospermopsis*), *Aphanizomenon*, *Dolichospermum*, and *Umezakia*. The toxin can also damage other major organs (kidney, lung, spleen, thymus, and heart).

Dermatotoxins affect the skin and can be produced by various cyanobacteria species with or without other toxins. Symptoms can occur quickly if the skin is not rinsed after contact with cyanotoxins. Signs include rashes, hives, swelling, itching, and excessive drooling and seizures. Dermatotoxins are not specifically part of toxin testing, although high cyanobacteria cell counts usually indicate the presence of dermatotoxins and the increased likelihood of associated illnesses.

Figure 2. Common Cyanobacteria Species Under a Microscope



1.3 EXPOSURE PATHWAYS

If cyanobacteria are producing toxins, cyanotoxins can be released into the water as cyanobacteria grow and die. Toxin concentrations can become elevated, particularly during a bloom event, concentrate along shorelines, and can persist in the environment after a visible bloom is over.

The primary exposure pathway for cyanotoxins is through ingestion of water. Ingestion of water can occur through both incidental and intentional pathways. Incidental ingestion is more likely in recreational waters. The risk of incidental ingestion is particularly high for children playing in near-shore areas since these areas are also where scums tend to accumulate.

Dermal irritant or allergic effects are possible from skin contact with cyanobacteria; however, the cyanotoxins are not likely to cross the skin barrier and enter the bloodstream. Inhalation and aspiration of toxin is possible, especially through activities where the toxin is aerosolized, such as water skiing or splashing.

A possible scenario for the intentional ingestion of recreational water is the use of lake water for drinking or cooking purposes by campers, hikers and backpackers. Camping filters, tablets, and boiling will not remove cyanotoxins. There is insufficient information to determine the risk of consuming fish caught in waters with toxigenic cyanobacteria. At a minimum, the fish should be rinsed with potable water and the organs should be removed and discarded prior to cooking fillets.

Montana public water suppliers are not federally mandated to monitor or treat for cyanotoxins. Thus, there is potential risk to consumers whose drinking water is sourced from a lake or reservoir during HAB season. Landowners with private drinking water sources from lakes or reservoirs with HAB potential are also at risk and should be cautious during HAB season. Do not drink water sourced from a HAB identified water body.

1.4 ANIMAL EXPOSURE

Pets and livestock may be at higher risk for cyanotoxin poisoning since they are more likely to drink contaminated water.

Late summer, times of drought, or wind blowing a bloom toward the animal access points are the times of greatest concern for livestock poisoning due to cyanotoxins. Immediate symptoms may include vomiting, diarrhea, dark urine, excessive thirst, shaking, itching, rash, respiratory paralysis, and death. Chronic exposure may include symptoms of anorexia, mental derangement, dehydration, hypoglycemia, and death.

If you suspect the presence of a HAB, do not let your pet or livestock drink the water, and report the incident on [HAB.MT.gov](https://hab.mt.gov). In the case of no other water source, the waterbody in question should be tested for cyanotoxins immediately. **Section 3** discusses testing methodologies.

If your pet or livestock has ingested a water source that is potentially or verifiably contaminated with cyanotoxins, call your veterinarian immediately. If your veterinarian is unfamiliar with cyanotoxin poisoning, please have them contact members of the State HAB Team or the State Veterinarian (**Section 4.0**). Additional information on animal cyanotoxin poisoning is available on the Centers for Disease Control and Prevention ([CDC](https://www.cdc.gov)) website.

In the case of a livestock death, the U.S. Department of Agriculture (USDA) Farm Service Agency (FSA) may be able to provide financial assistance through the [Livestock Indemnity Program](#) (LIP). To be eligible for livestock reimbursement through LIP, a water test is required to confirm the presence of cyanotoxins, and a veterinarian must provide proof of loss. Livestock producers can contact their [local FSA office](#) for assistance.

There are also funding opportunities available for livestock producers looking to provide livestock a new water source, such as an off-stream water or other grazing best management practices, that can reduce the risk of HAB exposure. These include but are not limited to the USDA Natural Resources Conservation Service (NRCS) Environmental Quality Incentives Program (EQIP) and DEQ's Nonpoint Source Pollution 319 Funding. Interested landowners can contact their [local NRCS field office](#) or the [Nonpoint Source Program](#) for more information.

2.0 GUIDELINES AND ADVISORIES

2.1 FINISHED DRINKING WATER

Finished drinking water is the transformation of raw water from surface water or groundwater sources into drinking water that is compliant with the [Safe Drinking Water Act](#) using an appropriate treatment technology. EPA has issued [Drinking Water Health Advisories](#) for the cyanobacterial toxins microcystins and cylindrospermopsin (**Table 1**). It is important to remember that these concentrations apply to finished drinking water. Young children are more susceptible than older children and adults as they consume more water relative to their body weight.

Health advisories are non-regulatory values, rather they serve as informal technical guidance to assist federal, state and local officials, and managers of public or community water systems to protect public health from contaminants. EPA has also published health effects support documents for the cyanobacterial toxins [microcystins](#) and [cylindrospermopsin](#). These documents contain the health effects basis for the development of health advisories for the protection of human health. In addition, EPA has published a health effects support document for [anatoxin-a](#) but concluded that there was not adequate information to support a health advisory for this toxin.

Table 1. EPA Drinking Water Health Advisory for Cyanotoxins (EPA, 2015a,b)

Cyanotoxin	Bottle-fed infants and pre-school children ¹	School-age children and adults ¹
Microcystins	0.3 ug/L	1.6 ug/L
Cylindrospermopsin	0.7 ug/L	3 ug/L

¹10 Day Exposure

Montana Public Water Suppliers (PWS) are not required to routinely monitor for cyanotoxins because cyanotoxins are not a federally regulated contaminant. It is up to the individual public water supplier to voluntarily monitor for cyanotoxins.

For more information, the DEQ's drinking water contact is Lisa Kaufman and can be reached by phone: 406-444-5313, or by email: LKaufman@mt.gov.

2.2 RECREATIONAL WATER

Montana has developed a three tier approach to public health advisories incorporating both [World Health Organization](#) (WHO) and [EPA guidelines](#) as shown in **Table 2**. The elevated cyanotoxin levels detected under Tier 2 pose more health risks than levels detected under Tier 1; however, it is difficult to test cyanotoxins frequently enough to determine when conditions change. Therefore, the State HAB Team recommends posting Caution signs for both scenarios and investing more time notifying water users if conditions reach Tier 2.

Table 2. Montana HAB Public Health Advisory Tiers for Recreational Waters

	Tier 1: Caution	Tier 2: Caution	Tier 3: Consider Closure
Relative Probability of Acute Health Effects ¹	Low	Moderate	High
Cyanobacterial Cell Density (cells/mL) ¹	<20,000	20,000 – 100,000	>100,000
Microcystins (ug/L) ^{1,2}	<4	4 – 20	>20
Anatoxin-a (ug/L) ³	Non-Detect	Detect – 20	> 20
Additional Factors	Visual presence but no reported illness	Reports of animal illness or death	Reports of human illness
Health Risks ¹	Negligible	Short-term effects such as skin irritation nausea, vomiting, diarrhea. Potential for long-term effects.	Short-term effects such as skin irritation nausea, vomiting, diarrhea. Potential for long-term effects and acute poisoning.
Recommended Actions	Post caution signs, visually monitor for changes	Post caution signs, notify private water users and media with advisory	Post closure signs, notify private water users and media with advisory, closures

¹WHO, 2003, ²EPA, 2016, ³CSWB, 2016

2.3 ADVISORIES

Recommended health advisories should be based on the guidelines and recommendations in **Table 1** and **2** following the decision flow chart shown in **Figures 3 and 4**. The steps in **Figure 3** are described in detail in **Appendix A**. For public drinking water suppliers, the State HAB team recommends notifying users after the first positive detection of cyanotoxins and following up with laboratory testing for confirmation. Each public water supplier may have a plan that describes how to notify water users in case of an emergency. It is recommended that the public water supplier develop a plan if one is not in place. The drinking water advisories would be based on **Table 1**. If toxicity exceeds these guidelines, all users should be notified as to not drink the water until further notice.

For recreational waters (**Figure 3**), the public at a minimum should be notified with advisory signage, following recommendations in **Table 2**. The water managers or regulatory authorities can print and laminate temporary “Caution” and “Closure” advisory signs from the following address: <http://dphhs.mt.gov/publichealth/FCSS/SanitarianResource/FCSForms>. Permanent signs are also available upon request. For private waters, such as stockwater ponds or water surrounded by private homeowners, a simplified decision flow chart is provided (**Figure 4**). The State HAB Team relies primarily on visual assessment and taxonomic ID in these instances, and EPA lab analysis is not available.

HABs and cyanotoxin conditions can change rapidly, often more quickly than is feasible to monitor for change. Due to this limitation, the State HAB team recommends posting Caution signs under most scenarios, even before cell densities or toxin concentrations reach Tier 2 conditions (**Table 2 and Figures 3 and 4**). Given the greater human health risk associated with Tier 2 conditions, water users and/or the media should be notified. If cell densities or toxin levels reach Tier 3 conditions, or if there are any reported animal or human deaths or illnesses, the State HAB Team recommends the managing jurisdiction (**Section 2.4**) immediately post caution signs and consult with State or County Human Health officials to determine next steps. This may include conducting subsequent field or laboratory testing (**Section 3.0**) and/or posting closure signs and closing some or all of the waterbody.

If there are no reported illnesses and a blue-green algal bloom has been visually verified (**Section 3.1**), it is recommended that the managing jurisdiction post caution signs. The managing jurisdiction has the option to then continue to monitor visually for any changes or to conduct field testing (**Section 3.2**). If the field testing yields a positive result for cyanotoxins, the State HAB Team recommends confirmation through laboratory analysis (**Section 3.3**). The results of the laboratory testing will better direct the water manager as to what level of advisory is needed (**Figure 3, Table 2**).

After an advisory has been issued, it is recommended that the jurisdiction conduct field and/or laboratory testing at a minimum of every two weeks. At least two weeks of visual assessment, field tests, or laboratory results indicating that the hazard has passed is recommended before removing or downgrading any advisory.

2.4 MANAGING JURISDICTION

A managing jurisdiction for a waterbody may include local health boards, local water user organizations, state and federal agencies, and private landowners. The local health boards and health officers have general authority to post health advisories and close water bodies per Montana Code Annotated (MCA) 50-2-116 and 50-2-118. The local health boards and health officers may also work with other managing jurisdictions to post advisories.

The State HAB Team requests all local managing authorities passively monitor for HABs within their jurisdictions and report any suspected HABs to HAB.MT.gov. A managing jurisdiction has the greatest familiarity and access to their local waterbody and would likely be the first to recognize a HAB before any other agency. This guidance is not suggesting that jurisdictions develop a HAB monitoring plan, rather encourages a local “eyes on the ground” monitoring approach. For any managing jurisdictions that would like to develop an active HAB monitoring plan, the State HAB Team can provide review and assistance.

Shorelines under state (FWP and State Lands) or federal control (BLM, BOR, and Forest Service) are the responsibility of the respective agency to monitor, test, and issue appropriate advisories. For privately accessed water bodies or shorelines, it is the responsibility of the private landowner to determine HAB concerns.

The authority to notify the media rests with the jurisdictional agency. The State HAB Team can provide recommendations as to how and when to notify the media. In the case of an extensive bloom that has the potential to affect multiple jurisdictions, it is recommended that all agencies coordinate with the State HAB Team to issue a unified message to the public.

The state recommends notifying any water users and the media for publicly accessible waterbodies when a Tier 2: Warning or Tier 3: Danger advisory is issued (**Table 2**). This may include notifying the local paper and television news station. The State HAB Team can assist in media releases and provide pertinent information necessary to protect public health.

It is strongly recommended that the responsible agency or landowner work in coordination with the State HAB Team during all stages of a potential bloom.

Figure 3. Decision Flow Chart for Harmful Algal Blooms in Recreational, Publicly Accessed Waters

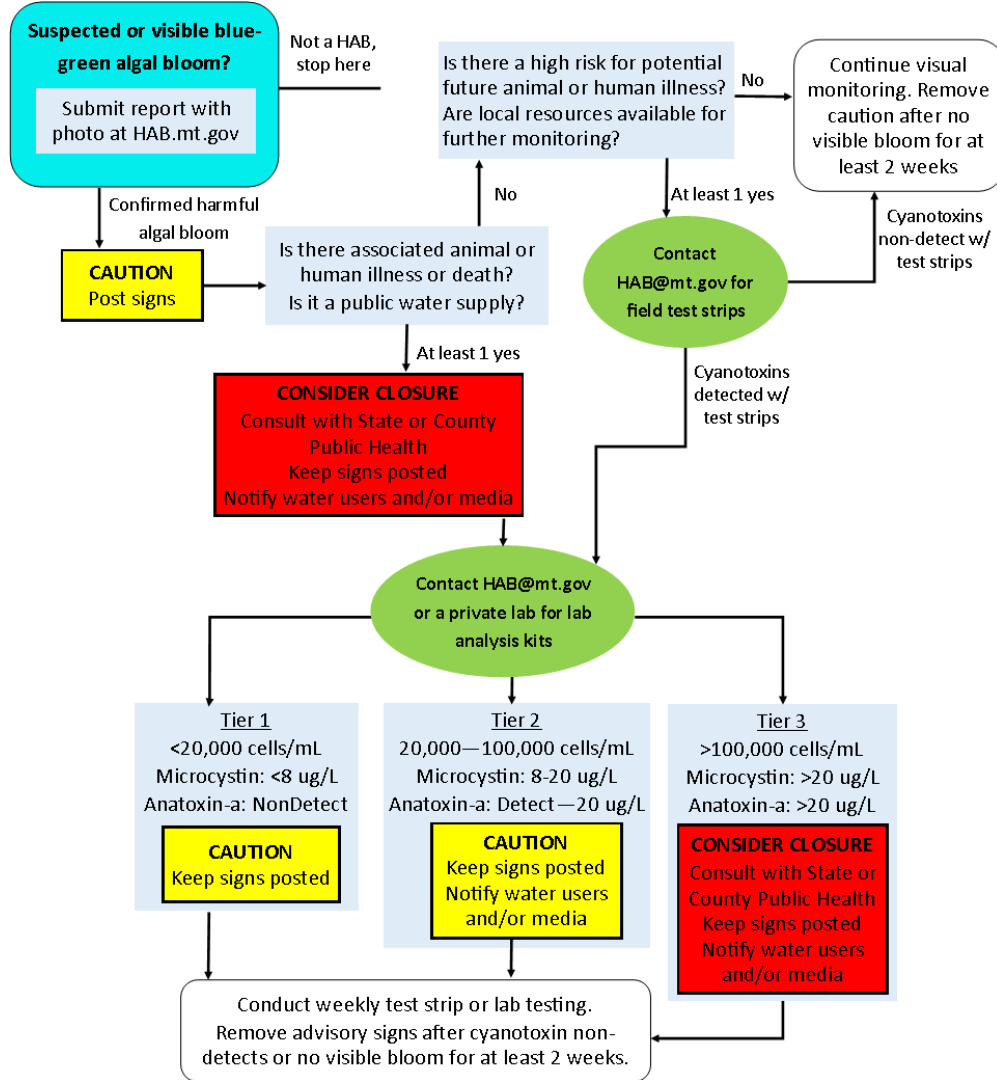
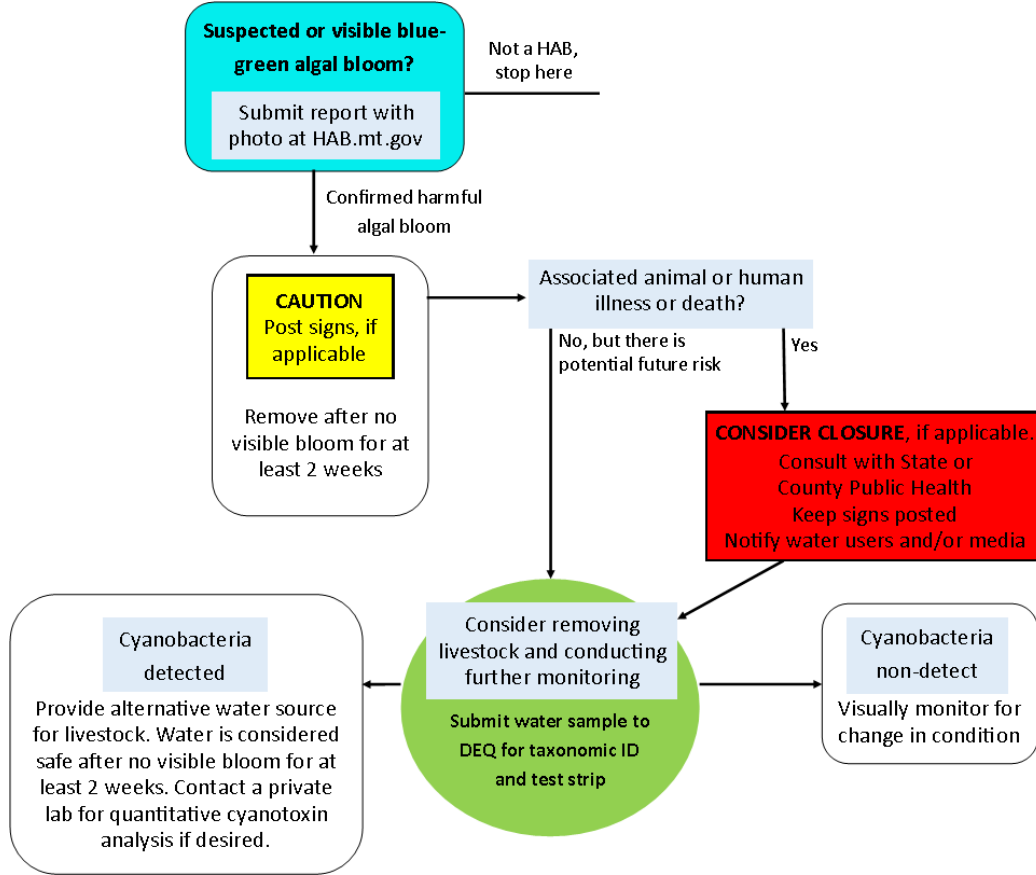


Figure 4. Decision Flow Chart for Harmful Algal Blooms in Waters Accessed by Private Property



3.0 MONITORING AND TESTING

Monitoring and testing is not mandated by the State. Each jurisdiction is responsible for monitoring and testing. As discussed in Section 2.4, the State HAB Team recommends, at a minimum, passive monitoring or an “eyes on the ground” approach to identifying HABs. If a HAB is suspected through visual assessment, the State HAB Team recommends reporting the occurrence to HAB.MT.gov and following the sequence of monitoring, testing and advisory activities shown in **Figure 3** and described in **Sections 3.1-3.5**.

Test kits and laboratory assistance is available at no cost through the State HAB program on a limited basis. Contact HAB@mt.gov for more information.

3.1 VISUAL ASSESSMENTS

If a potential bloom is identified, a visual assessment is recommended. A visual assessment includes documenting the color and physical nature of the bloom (e.g., floating scum/mats) using a digital camera (please take photos both close-up and of the extent of the bloom). In addition, the locations and extent of the bloom should be noted, especially if it is present near any public access.

All visual assessments and photos should be reported through the state reporting system HAB.MT.gov. The State HAB Team (**Section 4.0**) can assist in visual verification of a potential bloom.

3.2 FIELD TESTS

After a bloom has been visually verified, field tests are recommended for waterbodies that have an agricultural, recreational, or drinking water uses.

Easy-to-use strip tests detect the presence or absence of cyanotoxins and can be performed in the field without laboratory equipment. These strips will only indicate if the concentration of the cyanotoxin is above some fixed value specific to each type of test strip (e.g., 10 µg/L). A limited supply of test strips is available from the State HAB program, HAB@mt.gov. Test strips are also available directly from the manufacturer, [Abraxis, Inc.](#), at the cost to the managing jurisdiction (described in **Section 2.4**). Each test strip costs \$30 to \$50 depending on the cyanotoxin tested.

Test strips can detect anatoxin-a, cylindrospermopsin, and microcystins toxins at drinking water or recreational water advisory levels. The managing jurisdiction should decide which of these types of field test kits is most appropriate for their situation. At a minimum, use the microcystin recreational test kit (product number 520023), ideally with the anatoxin-a recreational test kit (product number 520042). The manufacturer has specific user guidelines that should be followed for accurate results. The test strip instructions are provided in **Appendix B** and available for download at [Abraxis, Inc.](#) Additionally, test strip instructions will be made available to those who are acquiring test strips from the State HAB Team. Test strips can be tricky to read. For confirmation of the reading, take a picture of the test strip and send it to the State HAB Team. For additional sampling procedures see **Section 3.4**.

Field tests should target areas with the highest likelihood or risk of animal or human-cyanotoxin interaction and exposure. These areas may include beaches, shoreline access areas, drinking water intakes, stock watering ponds, etc. The GPS location and general description of sample location should be recorded in field notes. It is important to note that the field tests will only produce semi-quantitative results for one specific cyanotoxin and serve as an initial screening process for the presence of cyanotoxins. Laboratory analysis (**Section 3.3**) is required to accurately measure cyanotoxin concentrations, speciate cyanobacteria, or provide cyanobacteria cell counts.

Positive or negative cyanotoxin detections should be reported to the State HAB Team. Caution signs should remain posted if field test results in detections above the test strip's detection limit. Additionally, the result should initiate additional public outreach, such as through a press release. Following up with laboratory analysis is recommended for waterbodies where closure advisories may be necessary to protect human health.

3.3 LABORATORY ANALYSIS

After visual verification of a bloom and/or a positive field test for cyanotoxins, samples may be collected for laboratory analysis. If it is the first time your organization is collecting samples for HAB analysis, it is recommended that you contact the State HAB Team to discuss a sampling and analysis plan. Laboratory analyses may be available through the Region 8 EPA laboratories at no cost to the managing jurisdiction or landowner. However, note that commercial laboratories may provide faster turn around times than the EPA laboratories. Waterbody managers may decide to pay for their own analysis depending on the urgency. The HAB Team (**Section 4**) is available for consultation to assist in the interpretation of laboratory results.

EPA Laboratory

A limited number of laboratory analyses from the EPA Region 8 Laboratories are available to Montana at no cost to the managing jurisdiction. To obtain a sample kit, please contact the State HAB Team, HAB@MT.gov,

or Tina Laidlaw at Region 8 EPA, Laidlaw.Tina@EPA.gov, (406) 457-5016. The test kit will come with the following items:

- Sampling procedures
- 1L PETG bottles
- Coolers
- Alcohol wipes
- Nitrile gloves
- Paper towels
- Gallon bags
- Ice packs
- FedEx forms with EPA account

Please read the sample collection and shipping procedures very carefully before commencing sampling (**Section 3.4** and **Appendix A**). Contact Tina Laidlaw at Region 8 EPA, Laidlaw.Tina@EPA.gov, (406) 457-5016, and notify her as to when you will be shipping your samples to the laboratory.

Commercial Laboratories

The laboratory must be contacted prior to sample collection and will provide required forms and protocols to be followed during sampling. The laboratory may provide bottles or recommend a type of bottle needed for sample collection.

The following are recommended commercial laboratories:

1. Phycotech, Inc.
620 Broad Street, Suite 100
St. Joseph, MI 49085
Phone: (269) 983-3654
info@phycotech.com
<http://phycotech.com/>
2. GreenWater Laboratories
205 Zeagler Drive Suite 302
Palatka, FL 32177
(877) 869-2542
info@greenwaterlab.com
<http://greenwaterlab.com/>

Please inquire from the individual laboratories about pricing and turn-around time.

Toxin analyses may include microcystins, anatoxin-a, cylindrospermopsin, and more depending on the laboratory. The analysis techniques include but are not limited to enzyme-linked immunosorbent assay (ELISA) and/or liquid chromatography-tandem mass spectrometry (LC-MS/MS).

Some labs can perform a preliminary qualitative analysis of samples. These methods will examine the presence or absence of cyanobacteria, the dominance of cyanobacteria, the identification of dominant cyanobacteria genera, and their relative abundance in the sample. From these results, toxicity testing and or further taxonomic analysis can be recommended.

Additional analysis may involve the direct observation and enumeration of the phytoplankton and any cyanobacteria present in the water column sampled. Depending upon the level of analysis, phytoplankton are identified to the lowest possible taxonomic category (generally species) and counted. Cell densities for all identified cyanobacteria species will be calculated.

If taxonomic analysis is conducted to the resolution of genera or cells/mL, the results will be quantitative, but for the contents of the sample volume alone. These methods will not quantify the composition of cyanobacteria in the waterbody, the water surrounding the bloom, or even the entirety of the bloom itself. For more intensive studies of cyanobacteria, protocols for quantitative phytoplankton collection methods are available and can be referred to if comprehensive quantified information is needed.

3.4. SAMPLING PROCEDURES

Samples can be collected from the water column or from the surface depending on the type or phase of the bloom. Cyanobacteria blooms often exhibit extensive temporal and spatial variation. As a result, it may be necessary to take multiple types of samples from various places around the water body to most effectively estimate the threat of the bloom to humans, pets or livestock.

There are several factors that should be considered when selecting sample locations and technique. Samples should be collected in areas of the lake where there is evidence of a potential bloom at the time of sample collection. Within the area of the bloom, samples should be collected where potential exposure is greatest. In many cases, this means samples should be collected near the shorelines where cyanobacteria cells accumulate, especially in areas that are frequented by recreationalists. Care should be taken not to include the lake bottom materials that may be disturbed and suspended if wading. Try to minimize other organisms, sediment, etc. in the sample.

Samples can be collected from the water column or from the surface depending on the type or phase of the bloom. Cyanobacteria blooms often exhibit extensive temporal and spatial variation. As a result, it may be necessary to take multiple types of samples from various places around the water body to most effectively estimate the threat of the bloom to humans, pets or livestock.

In addition to targeting potential recreational exposure areas, additional samples should be collected across the extent of the bloom so that the spatial extent of the bloom can be characterized, especially if the waterbody is a drinking water supply. Samples should be collected near the drinking water intake whenever possible. Visual estimates, documented by taking photographs and GPS coordinates, can also be used to determine the extent of the bloom.

Samplers should wear elbow/shoulder length gloves, eye protection (such as goggles), and waders/boots during sampling. Do not ingest water or allow the water to come into contact with exposed skin. Avoid inhaling spray caused by boats, wind or other water surface disturbances. If these conditions are present, wear a mask to avoid inhalation of water spray. Hands should be washed thoroughly after sampling before eating or drinking. Waders/boots should be rinsed of algal material using fresh water (not lake water) before storage.

The laboratory providing the analysis will either provide bottles or suggest bottle type and sizes for sample collection. The laboratory may also have specific procedures for sample collection such as freezing or not freezing the samples, chain of custody forms, and shipping procedures. If no labels are provided, label the bottle with a permanent marker with the following details: (1) Location, (2) Time, Date, and (3) Sampler Name. Field notes should contain more specific information about the location of the sample, such as GPS

coordinates, depth of sample, and whether the sample is a composite or grab sample. Additional sampling procedures are found in **Appendix A**.

3.5 REPORTING

All field notes and photos should be submitted to the state HAB Team. If a commercial laboratory is used for analysis, a copy of analytical results and chain of custody should be submitted to the State HAB Team preferably electronically via email HAB@mt.gov. To submit via mail, please contact a member of the HAB Team (**Table 3**).

4.0 PREVENTION AND TREATMENT

Availability of excess nutrients are a primary driver of HABs. Reducing upland sources of nutrient pollution is the most cost effective and sustainable approach, with the least potential for unintended consequences, to preventing HABs. Nutrients reach surface waters from a variety of sources including forestry and silviculture operations, road and streambank erosion, stormwater, fertilizers (e.g. from croplands, orchards, golf courses, and lawns), human and animal waste, and atmospheric contributions (e.g., wildfire smoke).

Best management practices can reduce nutrient pollution from these sources. For example, homeowners can regularly pump their septic systems to maintain its functionality or consider upgrading to a higher level of treatment. Fertilizers can be minimally applied or use native vegetation that doesn't require fertilizers or frequent watering in landscaping. Most importantly, native stream and lakeside vegetation, such as willows and cottonwoods, should be protected and restored. Activities can include avoiding trampling soils and vegetation when recreating, preventing additional development in floodplains, establishing native plant buffers between lawns and lakes or rivers, and installing fencing and upland water systems to prevent livestock from overgrazing vegetation and depositing nutrients into lakes or rivers.

The types and magnitude of nutrient sources will vary by watershed. Water managers and residents may be able to find information about nutrient pollution in their watershed in Total Maximum Daily Load documents (deq.mt.gov/water/surfacewater/TMDL), and the Nonpoint Source Program may be able to provide guidance to local jurisdictions interested in pursuing nutrient reduction strategies (deq.mt.gov/water/surfacewater/npspollution).

After upland sources of nutrients have been addressed, it is possible that in-lake treatment strategies may be required to fully address HAB occurrence. **That State HAB Team currently only promotes the prevention strategy of reducing upland sources of nutrients.** There are several chemical, mechanical, and biological treatment options. However, if they are not applied correctly, they may result in *increased* levels of cyanotoxins, or have unintended consequences for wildlife and downstream waters. Before deciding on any in-lake treatment strategy, the local jurisdiction should first study the lake to determine the most effective solution. Before implementing any in-lake treatment strategy, the local jurisdiction must acquire all required permits and contact relevant officials and stakeholders.

5.0 CONTACTS AND RESOURCES

5.1 MONTANA STATE HAB TEAM

The Montana State HAB Team consists of members from the DEQ, DPHHS, and FWP. The HAB Team can be reached at the email HAB@mt.gov or at the website HAB.MT.gov.

The primary DEQ contact is Hannah Riedl, Water Quality Specialist, hannah.riedl@mt.gov, 406-444-0549 and the primary DPHHS contact is Ed Evanson, Registered Sanitarian, EEvanson@mt.gov, 406-444-3284.

The following table lists the contact information for the members of the State HAB Team.

Table 3. Members of Montana State HAB Team

Name	Agency	Email	Phone
Hannah Riedl	DEQ	hannah.riedl@mt.gov	406-444-0549
Myla Kelly	DEQ	Mkelly2@mt.gov	406-444-3639
Erik Leigh	DPHHS	ELeigh@mt.gov	406-444-5306
Edward Evanson	DPHHS	EEvanson@mt.gov	406-444-5309
Dawn Nelson	DPHHS	Dawn.Nelson@mt.gov	406-417-9848
Trevor Selch	FWP	TSelch@mt.gov	406-444-5686

5.2 RESOURCES

Report a HAB: [HAB.MT.gov](https://www.hab.mt.gov)

Abraxis Test Strips: <https://www.eurofins-technologies.com/products/water/rapid-test-kits/algal-toxins.html>

Cyanobacteria Image Galleries:

<https://www.cyanosite.bio.purdue.edu/images/images.html>

EPA Cyanobacterial HABs: <https://www.epa.gov/nutrient-policy-data/cyanobacterial-harmful-algal-blooms-water>

Interstate Technology Regulatory Council Strategies for Preventing and Managing Harmful Cyanobacterial Blooms: <https://hcb-1.itrcweb.org/>

National Center for Disease Control (CDC) HABs:

<https://www.cdc.gov/habs/index.html>

World Health Organization Guidelines for Drinking Water Quality:

http://apps.who.int/iris/bitstream/10665/44584/1/9789241548151_eng.pdf

World Health Organization Guidelines for Safe Recreational Waters, V. 1 – Coastal and Fresh Waters:

<http://apps.who.int/iris/bitstream/10665/42591/1/9241545801.pdf>

World Health Organization’s “Toxic cyanobacteria in water: A guide to their public health consequences, monitoring and management”:

http://www.who.int/water_sanitation_health/publications/toxicyanobact/en/

United States Geological Survey: <http://pubs.usgs.gov/sir/2008/5038/>

6.0 REFERENCES

- CSWB, 2016. California State Water Board. Cyanobacteria guidance for recreational and related water uses (2016 updates). Available online at: www.mywaterquality.ca.gov/habs/resources
- EPA 2016, [Draft Human Health Recreational Ambient Water Quality Criteria or Swimming Advisories for Microcystins and Cylindrospermopsin](#), Office of Water, United States Environmental Protection Agency, EPA 822-P-16-002
- EPA 2015a, [Drinking Water Health Advisory for the Cyanobacterial Toxin Cylindrospermopsin, Office of Water](#), United States Environmental Protection Agency, EPA 820R15101
- EPA 2015b, [Drinking Water Health Advisory for the Cyanobacterial Microcystin Toxins, Office of Water](#), United States Environmental Protection Agency, EPA 820R15101
- UDWQ 2016, Recommended Standard Procedures for Phytoplankton Collection to Detect Harmful Algal Blooms, State of Utah Department of Environmental Quality Division of Water Quality.
- WHO, 2003: Algae and cyanobacteria in fresh water. Guidelines for Safe Recreational Water Environments World Health Organization, Geneva.
http://www.who.int/water_sanitation_health/publications/srwe1/en/
- WHO, 1999 Toxic cyanobacteria in water: A guide to their public health consequences, monitoring and management. (ed. I. Chorus).
http://www.who.int/water_sanitation_health/resourcesquality/toxcyanobacteria.pdf

APPENDIX A - STEPS FOR HAB DETERMINATION AND SAMPLE COLLECTION IN RECREATIONAL WATERS

Introduction

Harmful algal blooms are proliferations of cyanobacteria that have the potential to produce toxins and pose health risks for livestock, pets, and people. This document describes procedures for photo-monitoring and collecting water samples of potentially harmful algal blooms. The goal of conducting these activities is to identify cyanobacteria and quantify cyanotoxins to determine potential health risks or confirm the cause of health impacts.

Procedure

1. **DETERMINE HIGH RISK LOCATION(S).** Identify the location(s) with the greatest potential for human and/or animal exposure to cyanobacteria. This may be along a shoreline, ramp, or open water. Be mindful of wind direction, as cyanobacteria commonly accumulates in downwind areas. If taking photos or collecting water samples across multiple days, it may be necessary to add or change photo/sample locations because conditions can change rapidly.

Visual Assessment

2. **TAKE PHOTOS.** Take photos of each affected site. Plan to take more photos on subsequent days if conditions change or additional monitoring is conducted. For each set of photos, it is ideal to have a photo close up of the water, to capture the algal cells, and more distant, to capture the extent of the bloom. Keep a log of which photos are from which site on which days.
3. **INITIATE CONTACT WITH HAB EDUCATORS OR MANAGERS.** Often, a HAB educator or manager can use these photos to immediately distinguish a HAB from harmless algae, duckweed, or other materials. If there is uncertainty, or a HAB is suspected, it may be necessary to conduct further testing.

HAB conditions can change rapidly. Especially if animal or human illness occurs, it is important to capture conditions as close to when the symptoms occur. Start by reaching out to local health official, MSU Extension agent, fisheries biologist, or the State HAB Program (hab@mt.gov). These representatives can help guide the process of identifying a HAB using photos and, if needed, collecting water samples and submitting the samples to a lab.

Water Sampling

4. **SAFETY PRECAUTIONS.** When collecting a water sample, wear appropriate safety gear. Shoulder-length gloves, or at least latex gloves, should be worn during sample collection to prevent skin irritation. Wear goggles to prevent toxin exposure to the eyes during windy conditions, or if spray is likely. Avoid inhalation of spray by wearing a mask. Use chest waders and personal floatation devices if wading offshore. Never ingest water or allow skin contact. Wash hands with soap and water after sample collection and rinse waders and safety gear that's contacted the water, if practical. Disposable gloves should be discarded after each site.
5. **(This step may be run concurrently with water sampling, or skipped entirely, especially in the event of animal or human illness or death) OBTAIN AN ABRAXIS TEST STRIP.** Local MSU Extension agent, or fisheries biologist will likely have Abraxis test strips ready to deploy. These strips confirm the presence or absence of cyanotoxin concentrations above a threshold. Microcystin strips should be used at a minimum, and anatoxin-a if available. Closely follow instructions provided with the test strips and in

Appendix B. Results can be tricky to read. Always take a photo of the sample location and test strip result and send it to the State HAB Team (hab@mt.gov) for confirmation.

- 6. OBTAIN WATER SAMPLE CONTAINERS.** After photo assessment or Abraxis test strips determine a need for quantitative water sampling, EPA can overnight mail a sample kit cooler to a residence, local health official or Extension agent. This kit will contain instructions, gloves and all proper bottle types and preservatives to ensure accurate sample results. If you wish to collect a sample before laboratory-provided bottles arrive, use a plastic bottle, keep it dark, and freeze the sample immediately. If you wish to collect a sample for identification under a microscope outside the EPA lab, keep the sample in a glass or plastic container in a dark, cold (not freezing) location.

EPA will only accept samples using laboratory-supplied containers. If you wish to use a private lab, contact them directly to determine what types of sample containers they will accept.

- 7. NOTE: Water samples may be collected at any time, however, they should not be shipped on Fridays, Saturdays, or the day before a holiday. Receiving laboratories will likely be closed.**

LABEL WATER SAMPLES. If using bottles provided by a laboratory, label bottles according to laboratory guidelines. At a minimum, be sure to label bottles with:

1. Site name and/or location (e.g., Backyard Pond, West End, latitude + longitude)
2. Sampler name and contact information
3. Date and time collected

- 8. COLLECT WATER SAMPLE.** If surface scum is present, hold the sample bottle parallel to the water's surface and collect both scum and water (i.e., the top 1-2 inches of the water column). If the bloom is diffuse, with cyanobacteria cells distributed throughout the water column, invert and submerge the bottle to your elbow. Next, revert and raise the bottle to the surface so that the bottle samples the water column as evenly as possible. For EPA coolers, follow sample instructions included in kits; algal toxin bottles provided range from 30 to 60mL. Take photos of the water at each sample location and record the photo ID with the site name.

If the sample can be shipped overnight by the end of the day, immediately keep the sample stored in a cool dark place, like a cooler or refrigerator. If the sample cannot be shipped overnight by the end of the day, immediately freeze the sample.

- 9. SHIP WATER SAMPLES.** Pack the water samples securely in a cooler and fill the cooler with ice. Ensure that the cooler is securely sealed and closed using shipping tape. Ship the water samples in a cooler using overnight shipping to the designated lab.

- 10. SHARE RESULTS.** Share lab results with a local HAB educator or manager and the State HAB Program.

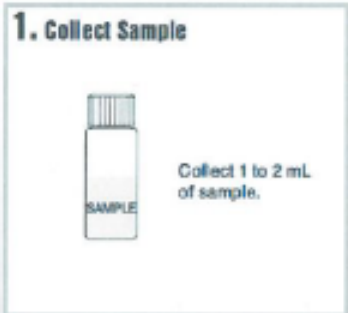




CONTINUE MONITORING. Continue visually monitoring conditions of the affected waterbody. Every 1-2 weeks, and especially if conditions worsen, it may be necessary to conduct additional round(s) of Abraxis field strip and water sample testing. Generally, the simplest and most dependable approach to HABs is to avoid all contact with visual blooms and for up to two weeks after the bloom has dissipated.

APPENDIX B – ABRAXIS TEST STRIP INSTRUCTIONS

Additional guidance can be found on the [Abraxis, Inc.](http://Abraxis, Inc. website) website.

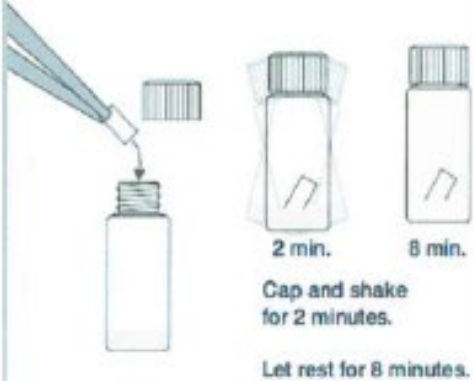
Abraxis Dipstick Test:

Microcystin test strips are a relatively cost-effective method for testing suspicious algal blooms for the most common algal toxin, microcystin. The drawback to using the dipsticks is that it is only available for microcystin. It does not provide any information on anatoxin, cylindrospermopsin, or saxitoxin. This test gives results for a limited range of concentrations (0-10 ppb) so multiple strips may be needed to determine if the 20 ppb threshold has been exceeded. If the first test is positive, prepare a 50:50 mixture of sample and non-chlorinated water, and run the strip test again. The results of this test should be doubled, so a reading of 6 ppb indicates a concentration of 12 ppb in the original sample. The table below provides supplemental photographs to demonstrate how to run the test.

Algal Toxin Strip Test Instructions	
<p>1. Collect Sample</p> 	<p>Mix your sample by gently shaking and pour a small amount into the "collection vial" provided in the kit (do not actually use this vial to collect the sample from the lake).</p> 
<p>2. Transfer/QuikLyse™ *</p> <p>Using the graduated pipette provided, transfer 1 mL of SAMPLE to the lysis vial containing the dried lysis reagent.</p>  <p>* Patent Pending</p>  <p>2 min. 8 min. Cap and shake for 2 minutes. Let rest for 8 minutes.</p>	<p>Note that the lysis vial has a small amount of white powder in the bottom, which is the lysis reagent.</p> 

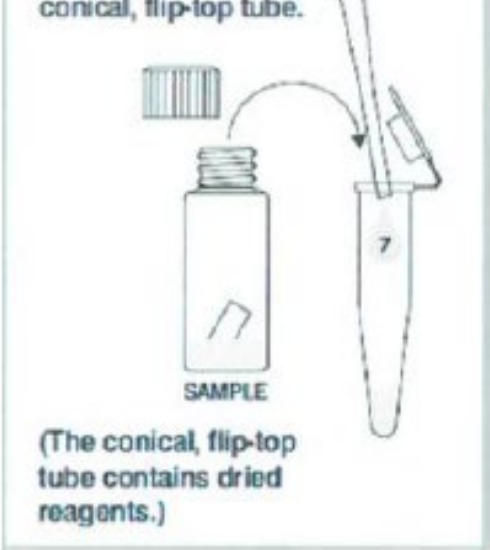
3. Add Reagent Paper/QuikLyse™

Using the forceps provided, add 1 reagent paper to the lysis vial.



4. Transfer

Using the pipette provided, add 7 drops of SAMPLE to the conical, flip-top tube.



Note that the flip top tube has a smear of purple reagent on the side of tube. This is normal.



5. Shake and incubate



Close the conical, flip-top tube and shake for 30 seconds.



(Dried reagents will dissolve, turning the sample purple.)



6. Test

Insert test strip into conical, flip-top tube with arrow pointing down. (sample pad down).





Incubate for 10 minutes.



7. Dry

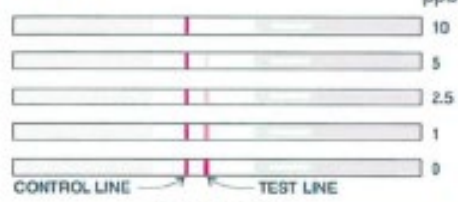
Remove test strip. Lay flat and allow to continue developing for 5 minutes.





8. Interpret

ppb

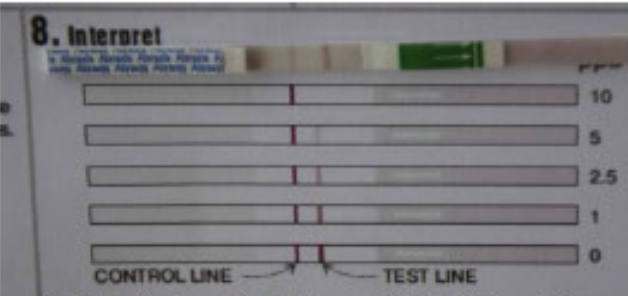


CONTROL LINE TEST LINE

INTERPRET TEST

CONTROL LINE	TEST LINE	INTERPRETATION
NO CONTROL LINE PRESENT	NO TEST LINE PRESENT	INVALID RESULT
CONTROL LINE PRESENT	NO TEST LINE PRESENT	> 10 ppb
CONTROL LINE PRESENT	MODERATE INTENSITY TEST LINE PRESENT	BETWEEN 0 AND 10 ppb

8. Interpret



CONTROL LINE TEST LINE

This test strip shows 0 ppb (parts per billion) of microcystins.

APPENDIX C - PUBLICLY ACCESSIBLE LAKES AND RESERVOIRS AND THEIR MANAGEMENT, WATER INTAKES, AND BLOOM OCCURRENCE.

The table below shows lakes and reservoirs that have been monitored by DEQ, are included in FWP's fishing regulations, or have been assessed with satellite imagery using the CyAN App (<https://www.epa.gov/water-research/cyanobacteria-assessment-network-mobile-application-cyan-app>). Information about lake management, drinking water intakes, and detections of cyanobacteria are shown.

“Satellite Imagery >100,000 cells/mL” indicates if a high density cyanobacteria bloom was detected with greater than 30% frequency for any of the years 2008-2011 and 2017 using the Cyan App. Note that not all lakes can be evaluated using this app, which is indicated by a “-”.

“State HAB Program monitoring detection” indicates if the lake has been identified as having a bloom by the state HAB program.

Water Name	County	Latitude Longitude	Public Management	Contact	Drinking Water Intake (DWI)	DWI within 10 miles downstream	Satellite Imagery >100,000 cells/mL	State HAB Program monitoring detection
Abbot Lake	Flathead	48.11864 -114.0526	None	Flathead County Health Dept: 406-751-8101	NO	YES	-	-
Ackley Lake	Judith Basin	46.95409 -109.9370	FWP State Parks	Jason Rhoten, (406) 454-5853 Clinton Smith, (406) 538-2445 Ext.227	YES	YES	-	-
Antelope Butte Lake	Teton	47.97249 -112.6316	FWP Wildlife Management Area	Jason Rhoten, (406) 454-5853 Katie Vivian, (406) 466-5621	NO	YES	-	-
Arod Lakes	Teton	47.990415 -112.0323	USFWS/FWP	Jason Rhoten, (406) 454-5853 Katie Vivian, (406) 466-5621	NO	NO	-	-
Ashley Lake	Flathead	48.20144 -114.5988	USFS: Flathead	Tally Lake Ranger District, 406-758-5204	YES	YES	No	-
Axolotyl lakes	Madison	45.2264 -111.8712	BLM	Dillon Field Office, 406-683-8000	NO	YES	-	-
Bair Reservoir	Meagher	46.58583 -110.5673	None	Meagher County Sanitarian, Eva Kerr, 406-547-3234	NO	YES	-	-
Basin Creek Lake	Carbon	45.14536 -109.4286	USFS: Custer Gallatin	Beartooth Ranger District 406-446-2103	NO	YES	-	-
Bearpaw Reservoir	Hill	48.3278 -109.6576	Hill County	Hill County Environmental Health, Clay Vincent, Sanitarian 406-400-2311	NO	NO	-	YES

Water Name	County	Latitude Longitude	Public Management	Contact	Drinking Water Intake (DWI)	DWI within 10 miles downstream	Satellite Imagery >100,000 cells/mL	State HAB Program monitoring detection
Beaver Creek Reservoir	Hill	48.406 -109.721	Hill County	Hill County Environmental Health, Clay Vincent, Sanitarian 406-400-2311	NO	NO	-	YES
Benton Lake	Cascade	47.66966 -111.3579	USFWS	Benton Lake National Wildlife Refuge 406- 727-7400	NO	YES	-	-
Big Lake	Stillwater	45.88395 -109.0471	FWP State Parks	Mike Ruggles, (406) 247-2961 Shannon Blackburn, (406) 247-2963	NO	YES	-	-
Big Moose Lake	Carbon	45.00448 -109.7662	USFS: Custer Gallatin	Beartooth Ranger District 406-446-2103	NO	YES	-	-
Bighorn Lake	Carbon	45.3062 -107.9734	National Park Service	Bighorn National Recreation Area 406-666- 2412	YES	YES	-	Yes
Black Canyon Lake	Carbon	45.06954 -109.5330	USFS: Custer Gallatin	Beartooth Ranger District 406-446-2103	NO	YES	-	-
Blacktail Meadows Pond	Beaverhead	45.22399 -112.6392	FWP	Travis, (406) 577-7870 Matt Jaeger, (406) 683-9310	NO	YES	-	-
Blanchard Lake	Flathead	48.381748 -114.3658	None	Flathead County Health Dept: 406-751-8101	No	YES	-	-
Bootjack Lake	Flathead	48.42265 -114.4929	USFS: Flathead	Tally Lake Ranger District 406-758-5204	NO	YES	-	-
Boxelder Reservoir	Sheridan	48.78905 -104.5496	City of Plentywood	County Sanitarian (406)-765-3458	NO	YES	-	-
Buffalohead Pond	Flathead	48.2246 -114.3209	City of Kalispell	City of Kalispell 406-758-7718	NO	YES	-	-
Bull Lake (near Troy)	Lincoln	48.23681 -115.8434	USFS: Kootenai	Three Rivers Ranger District (406) 295-4693	YES	YES	-	-
Bynum Reservoir	Teton	47.94839 -112.4367	BLM/DNRC State Lands	Teton County Health Department 406-466-2562	NO	YES	-	-
Cabinet Gorge Reservoir	Sanders	48.02404 -115.8491	USFS/Avista	Eric Oldenburg (406) 847-1290	YES	YES	No	YES

Water Name	County	Latitude Longitude	Public Management	Contact	Drinking Water Intake (DWI)	DWI within 10 miles downstream	Satellite Imagery >100,000 cells/mL	State HAB Program monitoring detection
Canyon Ferry Reservoir	Broadwater, Lewis and Clark	46.43711 -111.5272	BoR/some FWP	Jeff Baumberger, 406-247-7314. Consider contacting marinas	YES	YES	YES	YES
Chessman Reservoir	Jefferson	46.47063 -112.1888	USFS: Helena L&C	City of Helena DW supply: Eric Urban 457-8511	NO	YES	-	-
Clark Canyon Reservoir	Beaverhead	44.96866 -112.9119	BOR	Jeff Baumberger 406-247-7314	YES	YES	YES	YES
Cooney Reservoir	Carbon	45.4438 -109.2248	FWP State Parks	Marina Yoshioka 406-445-2326	YES	YES	-	YES
Cow Creek Reservoir	Blaine	48.087 -109.294	DNRC State Trust Lands	Blaine County Sanitarian: (406)868-4957	NO	NO	-	YES
Deadmans Basin Reservoir	Wheatland	46.34572 -109.4258	DNRC Water Resources	Water Resources HQ: 444-6646	NO	YES	NO	-
Dickens Lake	Lewis and Clark	47.60793 -112.6463	FWP	Jason Rhoten, (406) 454-5853 Katie Vivian, (406) 466-5621	NO	YES	-	-
Dickey lake	Lincoln	48.71 -114.82	USFS: Kootenai	Fortine Ranger District: (406) 296-2536	YES	NO	NO	-
Diversion Lake	Teton	47.617447 -112.7290	USFS: Lewis and Clark	Rocky Mountain Ranger District: (406) 466- 5341	NO	YES	-	-
Dry Bridge Pond	Flathead	48.175825 -114.2938	None	Chad Fincher 406-758-7718	NO	YES	-	-
Duck Lake	Glacier	48.87 -113.33	None	Blackfeet Nation Environmental Office: 406-338-7421	NO	NO	NO	-
Eastfork Reservoir	Fergus	46.97934 -109.2818	City of Lewistown	City office: 406-535-1760	NO	YES	-	-
Echo Lake (near Anaconda)	Carbon	45.13068 -109.7481	USFS: Custer Gallatin	Beartooth Ranger District 406-446-2103	NO	YES	-	-
Echo Lake (near Bigfork)	Flathead	48.12733 -114.0423	None	Flathead County Health Dept: 406-751-8101	YES	YES	-	-

Water Name	County	Latitude Longitude	Public Management	Contact	Drinking Water Intake (DWI)	DWI within 10 miles downstream	Satellite Imagery >100,000 cells/mL	State HAB Program monitoring detection
Elk Lake	Beaverhead	44.67606 -111.6235	USFS: Beaverhead Deerlodge	Dillon Ranger District: (406) 683-3900	NO	YES	-	-
Elks Club Pond	Fergus	47.05497 -109.4011	Pine Meadows Golf Course	Pine Meadows Golf Course, Lewistown (406) 538-7075	NO	YES	-	-
Elpestrine Lake	Carbon	45.0886 -109.7202	USFS: Custer Gallatin	Beartooth Ranger District 406-446-2103	NO	YES	-	-
Ennis Lake	Madison	45.41524 -111.6958	None/BLM	Madison County Sanitarian, 406-843-4275	YES	YES	NO	-
Eureka Pond	Lincoln	48.89693 -115.0623	Lincoln County	Lincoln County Environmental Health Specialist, (406) 283-2441	NO	YES	-	-
Eureka Reservoir	Teton	47.88132 -112.3145	None	Teton County Health Department 406-466-2562	NO	YES	-	-
Eyraud lakes	Pondera	48.01811 -111.9748	DNRC Water Resources/None	Pondera County Dept of Environmental Quality, Sanitarian 406-271-4020	NO	YES	-	-
Fairgrounds Pond	Lewis and Clark	46.61901 -112.0539	Lewis and Clark County	Jennifer McBroom, (406) 457-8584	NO	YES	-	-
Flathead Lake	Flathead, Lake	47.91654 - 114.09962	Numerous	Large lake, contact should be based off location nearest the report	YES	YES	NO	-
Fort Peck Kids Pond	Valley	48.05532 - 106.44065	US ACoE	Valley County Environemtnal Health Cameron Shipp 406-228-6264	NO	YES	-	-
Fort Peck Reservoir	Garfield, McCone, Petroleum, Phillips, Valley	47.934623 -106.4797	USFWS	Large lake, contact should be based off location nearest the report	YES	YES	NO	-
Four Horns Lake	Glacier	48.35 -112.71	None	Blackfeet Nation Environmental Office: 406-338-7421	NO	NO	NO	-
Fred Burr Lake	Ravalli	46.357461 -114.3203	USFS: Bitterroot	Stevensville Ranger District: (406) 777-5461	YES	YES	-	-
Freezeout Lake	Teton	47.66506 -112.0556	FWP/BoR	Jason Rhoten, (406) 454-5853 Katie Vivian, (406) 466-5621	NO	YES	YES	-

Water Name	County	Latitude Longitude	Public Management	Contact	Drinking Water Intake (DWI)	DWI within 10 miles downstream	Satellite Imagery >100,000 cells/mL	State HAB Program monitoring detection
Frenchtown Pond	Missoula	47.02317 -114.2582	FWP State Parks	Patrick Saffel, (406) 542-5507 William Knotek, (406) 542-5506	YES	YES	-	-
Fresno Reservoir	Hill	48.64 -109.9707	BLM	Hill County Environmental Health, Sanitarian 406-400-2311	NO	NO	NO	-
Georgetown Lake	Deer Lodge, Granite	46.18145 -113.2915	FWP/Granite County/ USFS: Deer Lodge	Patrick Saffel, (406) 542-5507 Bradley Liermann, (406) 825-5225	YES	YES	NO	-
Gheny Pond	Madison	45.528968 -112.3571	None	Madison County Sanitarian, 406-843-4275	NO	YES	-	-
Gibson Reservoir	Lewis and Clark, Teton	47.60401 -112.7944	USFS: Lewis and Clark	Rocky Mountain Ranger District: (406) 466-5341	NO	YES	-	-
Goose Lake	Madison	44.73058 -111.5851	USFS: Beaverhead Deerlodge	Dillon Ranger District: (406) 683-3900	NO	YES	-	-
Granite Lake	Park, Sweet Grass	46.03433 -110.293	USFS: Gallatin	Yellowstone Ranger District 406-222-1892	NO	YES	-	-
Halfbreed Lake	Stillwater	45.956 -109.1170	USFWS	Charles M. Russell National Wildlife Refuge Complex (406) 538-8706	NO	YES	-	-
Halfpint Reservoir	Valley	47.87699 -107.1246	BLM	Valley County Environmental Health Cameron Shipp 406-228-6264	NO	NO	-	-
Handkerchief Lake	Flathead	48.14094 -113.8260	USFS: Flathead	Hungry Horse Ranger District: 406-387-3800	NO	YES	-	-
Harrison Lake	Flathead	48.5183 -113.7684	Glacier National Park	Flathead County Health Dept: 406-751-8101	NO	YES	-	-
Hauser Reservoir	Lewis and Clark	46.70698 -111.8173	FWP/BLM	Large lake, contact should be based off location nearest the report	YES	YES	NO	YES
Hebgen Lake	Gallatin	44.7639 -111.2506	USFS	Northwestern Energy, Jordan Tollefson, 406-443-8907	YES	YES	YES	YES
Hidden Lake	Madison	44.71817 -111.5966	USFS: Beaverhead Deerlodge	Dillon Ranger District: (406) 683-3900	NO	YES	-	-
Holland Lake	Missoula	47.44831 -113.5967	USFS: Flathead	Swan Lake Ranger District 406-837-7500	YES	YES	-	-

Water Name	County	Latitude Longitude	Public Management	Contact	Drinking Water Intake (DWI)	DWI within 10 miles downstream	Satellite Imagery >100,000 cells/mL	State HAB Program monitoring detection
Hollecker Lake	Dawson	47.12794 -104.7294	Dawson County	Dawson County sanitarian, Kevin Pena, (406) 377-5772	NO	YES	-	-
Holter Lake	Lewis and Clark	46.93494 -111.9634	FWP/BLM/USFS	Large lake, contact should be based off location nearest the report	NO	YES	NO	YES
Home Run Pond	Valley	48.18392 -106.6202	City of Glasgow	City of Glasgow, Recreation (406) 228-2476 x 7	NO	YES	-	-
Homestead/ Medicine Lake	Roosevelt, Sheridan	48.39203 -104.5674	USFWS	Medicine Lake National Wildlife Refuge 406-789-2305	NO	YES	-	-
Horseshoe Lake (near Ferndale)	Lake	48.02027 -113.9929	FWP	Mike Hensler, (406) 751-4550 Leo Rosenthal, (406) 751-4548	NO	YES	-	-
Horseshoe Lake (Thompson Chain)	Lincoln	48.0799 -115.1718	FWP	Mike Hensler, (406) 751-4550 Brian Stephens, (406) 293-4161 Ext.204	NO	YES	-	-
Hungry Horse Reservoir	Flathead	48.20006 -113.7748	USFS: Flathead	Hungry Horse Ranger District: 406-387-3800	YES	YES	NO	-
Hyalite Reservoir	Gallatin	45.48225 -110.9686	USFS: Gallatin	Bozeman Ranger District: 406-522-2520; City of Bozeman	NO	YES	-	YES
Indian Road Pond	Broadwater	46.333029 -111.5301	Bureau of Reclamation	Jeff Baumberger 406-247-7314	NO	YES	-	-
Job Corps Pond (Warm Springs WMA)	Deer Lodge	46.196411 -112.7736	FWP	Patrick Saffel, (406) 542-5507 Caleb Uerling, (406) 542-5520	NO	YES	-	-
Kids Pond at WSWMA (Warm Springs WMA)	Deer Lodge	46.17632 -112.7875	MT Dept. of Corrections	MT Dept. of Corrections 406-444-3930	NO	YES	-	-

Water Name	County	Latitude Longitude	Public Management	Contact	Drinking Water Intake (DWI)	DWI within 10 miles downstream	Satellite Imagery >100,000 cells/mL	State HAB Program monitoring detection
Kintla Lake	Flathead	48.96 -114.31	Glacier National Park	Flathead County Health Dept: 406-751- 8101	NO	YES	NO	-
Lake Agnes	Beaverhead	45.51391 -112.8422	USFS: Beaverhead Deerlodge	Dillon Ranger District: (406) 683-3900	NO	YES	-	-
Lake Alva	Missoula	47.3144 -113.5818	USFS: Lolo	Seeley Lake Ranger District 406-677-2233	NO	YES	-	-
Lake Bowdoin	Phillips	48.40167 -107.6681	USFWS	Bowdoin National Wildlife Refuge 406-654-2863	NO	YES	YES	-
Lake Elmo	Yellowstone	45.8411 -108.4788	FWP State Parks	Mike Ruggles, (406) 247-2961 Shannon Blackburn, (406) 247-2963	NO	YES	-	YES
Lake Elwell (Tiber Reservoir)	Liberty, Toole	48.3707 -111.1912	Bureau of Reclamation	Jeff Baumberger 406-247-7314	YES	YES	NO	-
Lake Frances (Francis)	Pondera	48.29125 -112.2656	None	Pondera County Dept of Environmental Quality Sanitarian 406-271-4020	YES	YES	NO	-
Lake Helena	Lewis and Clark	46.69681 -111.9291	FWP Fishing Access	Jason Rhoten, (406) 454-5853 Adam Strainer, (406) 495-3263	NO	YES	YES	YES
Lake Inez	Missoula	47.28276 -113.5655	FWP	Patrick Saffel, (406) 542-5507 William Knotek, (406) 542-5506	NO	YES	-	-
Lake Kooconusa	Lincoln	48.73762 -115.3136	USFS: Kootenai	Large lake, contact should be based off location nearest the report	YES	YES	NO	-
Lake Mary Ronan	Lake	47.92816 -114.403	None	Lake County Environmental Health (406) 883-7236	YES	YES	-	-
Lake McDonald	Flathead	48.58 -113.93	Glacier National Park	Flathead County Health Dept: 406-751-8101	YES	YES	NO	-
Lake Sutherlin	Meagher	46.62421 -110.7363	DNRC State Trust Lands/none	Meagher County Sanitarian, 406-547-3234	NO	YES	-	-
Lamesteer National Wildlife Refuge	Wibaux	46.793160 -104.1960	USFWS	Lamesteer National Wildlife Refuge 406 789-2305	NO	NO	-	-

Water Name	County	Latitude Longitude	Public Management	Contact	Drinking Water Intake (DWI)	DWI within 10 miles downstream	Satellite Imagery >100,000 cells/mL	State HAB Program monitoring detection
Lebo Lake	Wheatland	46.31354 -110.0329	None	Local MSU Extension agent or county sanitarian	NO	YES	-	-
Lindbergh Lake	Missoula	47.3785 -113.7384	USFS: Flathead	Swan Lake Ranger District 406-837-7500	NO	YES	-	-
Little Bitterroot Lake	Flathead	48.11923 -114.7215	None	Flathead County Health Dept: 406-751-8101	YES	YES	NO	-
Loon Lake	Lake	48.02349 -113.9899	None; FWP nearby	Mike Hensler, (406) 751-4550 Leo Rosenthal, (406) 751-4548	NO	YES	-	-
Lost Lake	Lincoln	48.06237 -115.0476	None	Lincoln County Environmental Health Specialist (406) 283-2441	NO	YES	-	-
Lower Basin Creek Lake	Carbon	45.14536 -109.4286	USFS: Custer Gallatin	Beartooth Ranger District 406-446-2103	NO	YES	-	-
Lower Stillwater Lake	Flathead	48.536352 -114.5780	DNRC State Trust Lands	Flathead County Health Dept: 406-751-8101	YES	NO	-	-
Lower Thompson lake	Lincoln/Sand ers	48.01951 -115.0313	FWP	Mike Hensler, (406) 751-4550 Brian Stephens, (406) 293-4161 Ext.204	NO	YES	-	-
Martinsdale Reservoir	Wheatland	46.4433 -110.2743	FWP Access/None	Jason Rhoten, (406) 454-5853 Clinton Smith, (406) 538-2445 Ext.227	NO	YES	YES	-
McCormick Pond	Ravalli	46.5220 -114.0020	None	Ravalli County Environmental Health 406-375-6565	NO	YES	-	-
McGregor Lake	Flathead	48.03 -114.83	Multiple landowners	Flathead County Health Dept: 406-751-8101	YES	NO	-	-
Medicine Lake	Sheridan	48.47044 -104.4061	USFWS	Medicine Lake National Wildlife Refuge 406-789-2305	NO	YES	YES	-
Middle Foy Lake	Flathead	48.17324 -114.3687	None	Flathead County Health Dept: 406-751-8101	NO	YES	-	-
Middle Thompson Lake	Lincoln	48.0296 -115.0695	FWP	Mike Hensler, (406) 751-4550 Brian Stephens, (406) 293-4161 Ext.204	NO	YES	-	-

Water Name	County	Latitude Longitude	Public Management	Contact	Drinking Water Intake (DWI)	DWI within 10 miles downstream	Satellite Imagery >100,000 cells/mL	State HAB Program monitoring detection
Nelson Reservoir	Phillips	48.49111 -107.5485	BoR	Jeff Baumberger 406-247-7314	NO	YES	YES	YES
Nevada Lake	Powell	46.79529 -112.7946	DNRC Water Resources	Mark McNearney 444-6693	NO	YES	-	YES
Nilan Reservoir	Lewis and Clark	47.4797 -112.5368	Private/DNRC State Trust Lands	Lewis and Clark County Environmental Health: 406-447-8351	NO	YES	-	YES
Noxon Reservoir	Sanders	47.88911 -115.7083	USFS/Avista	Eric Oldenburg (406) 847-1290	YES	YES	NO	-
Ostle Reservoir	Teton	47.97249 -112.6316	FWP Wildlife Management Area	Jason Rhoten (406) 454-5853 Katie Vivian (406) 466-5621	NO	YES	-	-
Otter Lake	Madison	44.732568 -111.5836	USFS: Beaverhead Deerlodge	Dillon Ranger District: (406) 683-3900	NO	YES	-	-
Our Lake	Teton	47.83642 -112.8099	USFS: Helena L&C	Rocky Mountain Ranger District: (406) 466-5341	NO	YES	-	-
Painted Rocks Lake	Ravalli	45.70158 -114.2956	FWP State Parks/USFS: Bitterroot	Painted Rocks State Park: 406-273-4253	NO	YES	-	-
Pelican Point #1	Cascade	47.20048 -111.7802	FWP	Jason Rhoten (406) 454-5853 Jason Mullen (406) 454-5855	NO	YES	-	-
Pine Grove Pond	Flathead	48.24886 -114.2888	FWP	Mike Hensler (406) 751-4550 Kenneth Breidinger (406) 751-4543	NO	YES	-	-
Pishkun Reservoir	Teton	47.69066 -112.4651	BoR	Jeff Baumberger 406-247-7314	NO	YES	NO	-
Placid Lake	Missoula	47.12 -113.53	Mostly private	Missoula Valley Water Quality District: (406) 258-4890	YES	NO	NO	-
Priest Butte Lake	Teton	47.75262 -112.1126	FWP	Jason Rhoten (406) 454-5853 Katie Vivian (406) 466-5621	NO	YES	-	-
Quake Lake	Gallatin , Madison	44.85015 -111.4001	USFS: Custer Gallatin	Hebgen Lake Ranger District: (406) 823- 6961	YES	YES	-	-
Racetrack Pond	Powell	46.27144 -112.7409	State of Montana	Powell County (406) 846-9786	NO	YES	-	-

Water Name	County	Latitude Longitude	Public Management	Contact	Drinking Water Intake (DWI)	DWI within 10 miles downstream	Satellite Imagery >100,000 cells/mL	State HAB Program monitoring detection
Rat Lake	Gallatin	45.42216 -111.1743	USFS: Custer Gallatin	Bozeman Ranger District: 406-522-2520	NO	YES	-	-
Red Rock Lakes	Beaverhead	44.63749 -111.8406	USFWS	Red Rock Lake National Wildlife Refuge 406-276-3536	NO	YES	NO	-
Ross Reservoir	Blaine	48.29084 -109.4325	None	Blaine County Sanitarian: (406)868-4957	NO	YES	-	-
Ruby River Reservoir	Madison	45.20409 -112.1452	Mostly private	Madison County Sanitarian, 406-843-4275	NO	YES	-	-
Saint Mary Lake	Glacier	48.69 -113.52	Glacier National Park	Glacier County Sanitarian: (406)873-3648	YES	YES	NO	-
Salmon Lake	Missoula	47.09145 -113.4006	FWP/USFS: Lolo/private	Multiple jurisdictions, work with Missoula County	YES	YES	-	YES
Sawtooth Lake	Beaverhead	45.43244 -113.0323	USFS: Beaverhead Deerlodge	Wise River Ranger District: (406) 832-3178	NO	YES	-	-
Seeley Lake	Missoula	47.19575 -113.5131	USFS: Lolo	Seeley Lake Ranger District 406-677-2233; work with Missoula County and/or City of Seeley Lake	YES	YES	YES	YES
Shady Lane Pond	Flathead	48.21143 -114.2627	FWP	Mike Hensler (406) 751-4550 Kenneth Breidinger (406) 751-4543	NO	YES	-	-
Silver Lake	Deer Lodge	46.16722 -113.2273	Private	Deer Lodge County Sanitarian 406-563-4066	NO	YES	-	-
Skyline Pond	Butte/Silver Bow	45.98522 -112.4812	Local government	Butte Silver Bow Environmental Health Dept: (406) 497-5020	NO	YES	-	-
Smith Lake	Flathead	48.11372 -114.4449	USFWS/FWP Access location	Mike Hensler (406) 751-4550 Kenneth Breidinger (406) 751-4543	NO	YES	-	-
Spidel Waterfowl Production Area	Golden Valley, Yellowstone	46.14 -108.85	USFWS	Golden Valley County Sanitarian: (406) 535-7466	NO	YES	-	-
Split Rock Lake	Teton	47.66204 -112.5228	DNRC State Trust Lands/BoR/Private	Teton County Health Department 406-466-2562	NO	YES	-	-

Water Name	County	Latitude Longitude	Public Management	Contact	Drinking Water Intake (DWI)	DWI within 10 miles downstream	Satellite Imagery >100,000 cells/mL	State HAB Program monitoring detection
Spotted Eagle Pond	Custer	46.3909 -105.8545	Miles City	Custer County Public Health: (406) 874-8700	NO	YES	-	-
Spring Meadow Lake	Lewis and Clark	46.61133 -112.0752	FWP	Jason Rhoten (406) 454-5853 Adam Strainer (406) 495-3263	NO	YES	-	-
Swan Lake	Lake	47.94611 -113.8786	USFS: Flathead/USFWS /Private	Flathead County Health Dept: 406-751-8101	YES	YES	NO	-
Swazee Lake	Lewis and Clark	47.53839 -112.6103	FWP	Jason Rhoten (406) 454-5853 Katie Vivian (406) 466-5621	NO	YES	-	-
Tally Lake	Flathead	48.40176 -114.5551	USFS: Flathead	Tally Lake Ranger District 406-758-5204	NO	YES	NO	-
Tongue River Reservoir	Big Horn	45.08357 -106.8001	DNRC Water Resources	Water Resources HQ: 444-6646	YES	YES	-	-
Troy Pond	Lincoln	48.47066 -115.890	City of Troy	City of Troy: 406-295-4151	NO	YES	-	-
Tunnel Lake	Teton	47.64971 -112.5986	Bureau of Reclamation	Jeff Baumberger 406-247-7314	NO	YES	-	-
Twin Lakes	Beaverhead	45.41199 -113.6942	USFS: Beaverhead Deerlodge	Dillon Ranger District: (406) 683-3900	YES	YES	-	-
Upper Stillwater Lake	Flathead	48.5908 -114.6392	DNRC State Lands/USFS: Flathead	Flathead County Health Dept: 406-751-8101	NO	YES	-	-
Upper Thompson Lake	Lincoln	48.05611 -115.1154	FWP	Mike Hensler (406) 751-4550 Brian Stephens (406) 293-4161 Ext.204	NO	YES	-	-
Upsata Lake	Powell	47.07877 -113.2206	Private/USFWS	Powell County (406) 846-9786	NO	YES	-	-
Vigilante Pond	Madison	45.291637 -111.9489	State of Montana	Madison County Sanitarian, 406-843-4275	NO	YES	-	-

Water Name	County	Latitude Longitude	Public Management	Contact	Drinking Water Intake (DWI)	DWI within 10 miles downstream	Satellite Imagery >100,000 cells/mL	State HAB Program monitoring detection
Wade Lake	Madison	44.81475 -111.5709	USFS: Beaverhead Deerlodge	Dillon Ranger District: (406) 683-3900	YES	YES	-	-
War Horse Lake	Petroleum	47.11927 -108.5512	USFWS/BoR	Charles M. Russell National Wildlife Refuge Complex (406) 538-8706	NO	NO	YES	-
Waterton Lake	Glacier	48.98 -113.90	Glacier National Park	Glacier County Sanitarian: (406)873-3648	NO	NO	NO	-
Whitefish Lake	Flathead	48.45581 -114.3792	Private	City of Whitefish, Parks and Recreation: 406-863-2470	YES	YES	NO	-
Whitetail Reservoir	Jefferson	46.07926 -112.2730	USFS: Beaverhead Deerlodge	Butte Ranger District: (406) 494-2147	NO	YES	YES	-
Widgeon Pond	Beaverhead	44.6464 -111.6550	USFWS	Red Rock Lake National Wildlife Refuge 406-276-3536	NO	YES	-	-
Wild Horse Lake	Petroleum	47.18628 -108.5432	Private/BLM	Petroleum County: (406) 429-6511	NO	NO	YES	-
Willow Creek Reservoir	Lewis and Clark	47.56174 -112.4496	BoR	Jeff Baumberger 406-247-7314	NO	YES	YES	-