



UTAH DEPARTMENT of
**ENVIRONMENTAL
QUALITY**



Utah Department of
**Health & Human
Services**

Utah Harmful Algal Bloom (HAB) Advisory Guidance

Updated: April 11, 2023

This guidance, issued jointly by Utah Division of Environmental Quality (UDEQ) and Utah Department of Health and Human Services (UDHHS) provides guidance for local health departments and other agencies managing recreational water bodies experiencing a harmful algal bloom (HAB).

Harmful Algal Bloom (HAB) Basics

HABs occur when naturally occurring cyanobacteria, also known as blue-green algae, quickly multiply to high densities and form visible water discoloration, scums, and/or mats. HABs can occur year-round, but are most common in the summer when abundant sunlight and warm, stagnant water combine with high nutrient levels.

Many species of cyanobacteria are toxigenic and may produce dangerous cyanotoxins that can harm people, pets, livestock, and wildlife. Freshwater cyanotoxins include microcystins, cylindrospermopsin, saxitoxins, and anatoxin-a. Exposure to cyanotoxins may cause short-term or long-term illness and has been known to kill pets and wildlife. Exposure to the cyanobacterial cells themselves can result in less serious health effects, even when no toxins are present (EPA, 2019).

Exposure routes

People may be exposed to cyanotoxins and cyanobacteria while recreating in Utah waterbodies via incidental ingestion, skin contact, and inhalation of contaminated aerosols. Studies of toxin characteristics and human behavior indicate that oral ingestion is the largest source of recreational exposure to cyanotoxins. Ingestion and skin contact are likely to be important routes of exposure to cyanobacterial cells.

As with most environmental exposures, children are expected to be at greater risk than adults. Children have smaller body mass, spend more time in contact with the water, and typically swallow more water while recreating.

Animals, especially dogs, are more likely to experience severe HAB health effects. Pets, livestock, and wildlife may drink directly from an area experiencing a bloom or ingest cyanobacteria material while grooming.

Cyanotoxins and fish

Cyanotoxins can accumulate in fish in waters with high toxin levels. The highest concentrations are in the organs (particularly the liver) and fat deposits; muscle tissue typically has lower toxin levels. Fish taken from waters with intermittent blooms (as in Utah) are unlikely to have toxin levels in muscle that present a health concern. However, there is considerable uncertainty.

For fish caught in waters during an algal bloom, UDHHS and UDEQ recommend discarding the guts and skin, eating only the filets, and rinsing them with clean water (e.g., tap or bottled).

Other exposure routes

Cyanotoxin exposure may be a concern for crop irrigation and livestock watering. Contact the Utah Department of Agriculture for guidance: ag.utah.gov; (801) 538-7100.

A rigorous program is in place for cyanotoxin monitoring in public drinking water. Contact the Utah Division of Drinking Water for more information: drinkingwater.utah.gov; (801) 536-4200.

For other exposure routes, including secondary use water exposure, contact UDEQ and UDHHS for consultation.

Adverse health effects

Exposure to HABs can cause a variety of health effects, from relatively mild to potentially serious (EPA, 2019; WHO, 1999; WHO, 2003). Symptoms depend on many factors, including the amount of toxins and/or cyanobacteria, the type of toxin and/or cyanobacteria, and the route and length of exposure. Even in the absence of toxins, there are significant associations between cyanobacterial cells and adverse health effects (EPA, 2019).

Individuals who believe they may be experiencing symptoms of exposure should contact the Utah Poison Control Center at 1-800-222-1222. We ask that information about HAB-related illness in humans and animals also be reported to the UPCC. These data are relayed to the CDC and help expand our knowledge about HABs.

Human symptoms

Ingestion

- Vomiting
- Diarrhea
- Headache
- Tingling sensation
- Trouble breathing
- Dizziness/weakness

Skin contact

- Eye irritation
- Rash
- Hives
- Blisters or sores

Inhalation

- Nose irritation
- Sore throat
- Coughing
- Wheezing
- Trouble breathing

Animal symptoms

Symptoms include weakness, fatigue, excessive salivation or drooling, staggering, difficulty breathing, vomiting, convulsions, liver damage or failure, and death.

HAB Identification

HABs can occur in a variety of colors, including bright blue, green, white, brown, and red. More than one color may be present. HABs often (but not always) form scums or mats, and may look like thick paint floating on the water. They may also give off a foul odor. There is no way to determine if a suspected bloom is toxic by looking at it. UDEQ maintains a [webpage with photographs to aid identification](#).

In addition to visual cues, toxigenic cyanobacteria counts and cyanotoxin analyses can be used to identify a HAB. Toxigenic cyanobacteria cell counts present an empirical measure of bloom density and information on dominant bloom species. Cell counts also act as a proxy measure of cyanotoxins, including those that are not currently suitable for analysis. Direct analysis for specific toxins is also used to quantify health risk from a HAB.

Sampling procedures

UDEQ had established recreational water quality sampling procedures for HABs. For guidance documents, forms, labels, and additional information, visit the [UDWQ webpage](#). Two related SOPs are available:

- [SOP for collecting water samples](#)
- [SOP for collecting fish and wildlife samples](#) from mortality events

Sampling for HAB monitoring is generally conducted by UDWQ staff or local health department partners.

Public Health Advisories for HABs

UDHHS and UDEQ have developed a three-tier approach to public health advisories for HABs. These advisories incorporate a variety of indicators, but primarily rely on cyanotoxin concentration and toxigenic cyanobacterial cell density. Typically, the highest level of advisory indicated by any of the measures is recommended to be protective of public health.

Table 1 summarizes the recommended public health advisory tiers. [Example advisory signs](#) can be found at [habs.utah.gov](#). Once an advisory is issued, at least two weeks of data indicating that the hazard has passed are recommended before removing the advisory.

Authority

In Utah, the authority to post health advisories and close water bodies lies with the local health departments. UDHHS and UDEQ provide support and data to these local partners.

A local health department may:

- Prepare, publish, and disseminate information necessary to inform and advise the public concerning the health and wellness of the population, specific hazards, and risk factors. – Utah Code 26A-1-114 (1)(i)(i)
- Close theaters, schools, and other public places and prohibit gatherings of people when necessary to protect public health. – Utah Code 26A-1-114 (1)(e)

Advisory guidance thresholds

Table 1. Advisory guidance thresholds for Utah recreational waters affected by a HAB.

Health Watch		Warning Advisory	Danger Advisory
<p>This is not a formal advisory level. Rather, a HEALTH WATCH indicates evidence that a bloom may exist or become more severe. Increased monitoring and surveillance are strongly recommended.</p>	Toxigenic cyanobacteria cell density (cells/mL) ^{1,2,3}	100,000 ^A	See footnote B
	Microcystins (µg/L) ^{1,2,3}	8	2,000
	Cylindrospermopsin (µg/L) ³	15	See footnote B
	Anatoxin-a (µg/L) ^{3,4,5}	15	90
	Saxitoxins (µg/L) ^{3,4,6}	8	75
<p>Indicators may include:</p> <ul style="list-style-type: none"> • Visual reports • Reports of animal or human illness • Detection of cyanotoxins or toxigenic cyanobacterial cell density below thresholds 	Health risks ^{1,2,3}	<p>Potential for long-term illness</p> <p>Short-term effects (e.g., skin and eye irritation, nausea, vomiting, diarrhea)</p>	<p>Potential for acute poisoning</p> <p>Potential for long-term illness</p> <p>Short-term effects (e.g., skin and eye irritation, nausea, vomiting, diarrhea)</p>
<p>Consider cautioning users depending on specifics of the event and waterbody. UDWQ may share a HEALTH WATCH on habs.utah.gov immediately after receiving data on a suspected or confirmed HAB</p>	Recommended actions	<p>Issue WARNING advisory to avoid primary contact recreation</p> <p>Post WARNING signs</p> <p>Sampling recommended at least weekly</p>	<p>Issue DANGER advisory to avoid primary contact recreation</p> <p>Post DANGER signs</p> <p>Consider CLOSURE</p> <p>Sampling recommended at least weekly</p>

¹ WHO, 2003. Guidelines for safe recreational water environments, Volume 1, Chapter 8: Algae and cyanobacteria in fresh waters.

² WHO, 2021. Toxic cyanobacteria in water (Second Edition).

³ EPA, 2019. Recommended human health recreational ambient water quality criteria or swimming advisories for microcystins and cylindrospermopsin.

⁴ OHA, 2021. Advisory Guidelines for Harmful Cyanobacteria Blooms in Recreational Waters.

⁵ CWQMC, 2016. California Water Quality Monitoring Council. Cyanobacteria guidance for recreational and related water uses (2016 update).

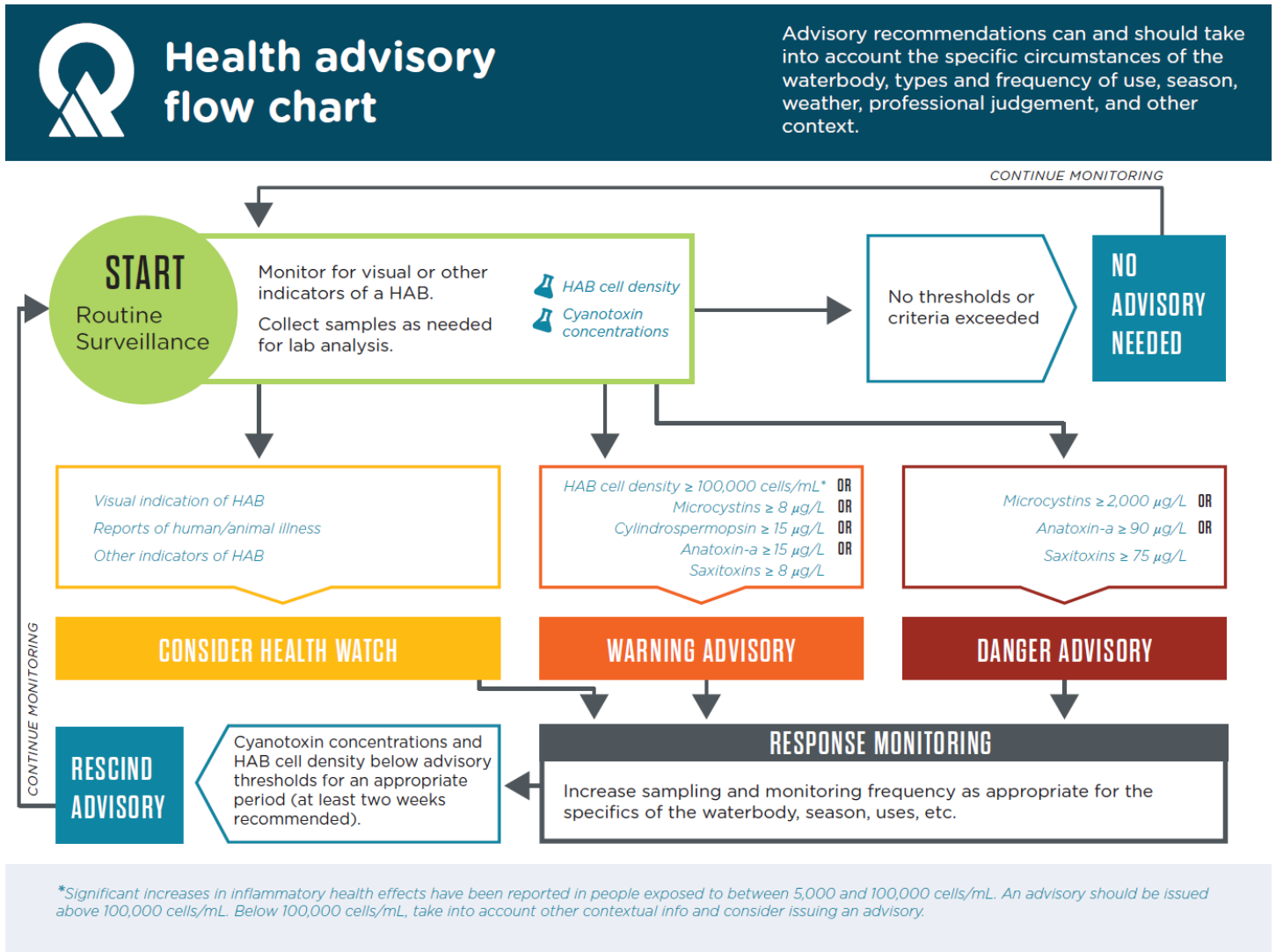
⁶ EFSA (2009). Scientific Opinion: Marine biotoxins in shellfish – Saxitoxin group. The EFSA Journal 1019, 1–76.

^A Human symptoms have been reported between 5,000 – 100,000 cells/ml (EPA 2019). At 5,000 – 100,000 cells/mL, LHDs should take into account contextual information and consider issuing an advisory.

^B Data are sparse on where cylindrospermopsin and cell density danger advisory breakpoints should be. Consult with UDEQ and UDHHS as needed on this issue. LHDs should take into account contextual information when considering the appropriate advisory level.

Advisory guidance process

Figure 1. Flowchart showing a typical process for monitoring and responding to a HAB on a recreational water body.



Contact information

Report a bloom: UDEQ 24-hour Spill Hotline: (801) 536-4123

Immediate health concerns: Utah Poison Control Center: 1-800-222-1222

Human & animal illness info: Utah Poison Control Center: 1-800-222-1222

Utah Division of Water Quality: (801) 536-4300; habs.utah.gov

- Hannah Bonner, hbonner@utah.gov

- Ben Holcomb, bholcomb@utah.gov

Utah Department of Health & Human Services: (801) 538-6191; [website](#)

- Alejandra Maldonado, alejandramaldonado@utah.gov

References

CWQMC, 2016. California Water Quality Monitoring Council. Cyanobacteria guidance for recreational and related water uses (2016 update). Available online at: mywaterquality.ca.gov/habs/resources/habs_response.html

EFSA, 2009. European Food Safety Authority. Scientific Opinion: Marine biotoxins in shellfish -- Saxitoxin group. The EFSA Journal 1019, 1–76.

EPA, 2019. U.S. Environmental Protection Agency. Recommended human health recreational ambient water quality criteria or swimming advisories for microcystins and cylindrospermopsin. Available online at: <https://www.epa.gov/sites/default/files/2019-05/documents/hh-rec-criteria-habs-document-2019.pdf>

OHA, 2021. Oregon Health Authority. Advisory Guidelines for Harmful Cyanobacteria Blooms in Recreational Waters. Available online at: https://www.oregon.gov/oha/PH/HEALTHYENVIRONMENTS/RECREATION/HARMFULALGAE/BLOOMS/Pages/resources_for_samplers.aspx

WHO, 2003. World Health Organization. Guidelines for safe recreational water environments, Volume 1, Chapter 8: Algae and cyanobacteria in fresh waters. Available online at: <https://apps.who.int/iris/handle/10665/42591>

WHO, 2021. World Health Organization. Toxic cyanobacteria in water (Second Edition). Available online at: <https://www.who.int/publications/m/item/toxic-cyanobacteria-in-water---second-edition>

Appendix A: Rationale for 2023 Addition of Saxitoxin Guidelines

The only major revision enacted between the 2021 and 2023 HAB Advisory Guidance is the addition of advisory thresholds for saxitoxins.

Saxitoxins are one of the most potent natural toxins¹ and pose a serious health risk to humans and animals. Saxitoxin is a neurotoxin and has been documented causing symptoms such as numbness, vertigo, paralyzation, and death². At least six cyanobacteria species commonly found in Utah have been established as known freshwater saxitoxin producers³. Likewise, low levels (<0.1 µg/L) of saxitoxins were detected in four different recreational Utah water bodies between 2021-2022. With known saxitoxin producers and production occurring in Utah, it is appropriate to establish guidance for health department response.

Utah’s saxitoxin guidance values are based on the latest scientific literature, precedent set by other states, and EPA recommendations. The guidance values for saxitoxin, as with other toxins, are based on the assumption of a single, acute exposure. The formulation used in calculating saxitoxin guidance values (see **Figure A1**) is based on EPA mean values for body weight and incidental ingestion for a child 6-11 years of age⁴. The cyanotoxin-specific reference dose (RfD) was taken from the European Food Safety Authority acute RfD. This value is used by at least eight other US states for saxitoxin guidance (See **Table A1**). In calculating the Warning Advisory level, an uncertainty factor of 10 was applied for database limitations as described by Oregon⁵. This results in a Warning Advisory threshold of 8 µg/L and a Danger Advisory of 75 µg/L for saxitoxins.

Figure A1. Formulation for calculating saxitoxin recreational threshold.

$$\text{Recreational threshold} = \frac{\text{RfD} \times \text{BW}}{\text{IR}} \times \text{CF}$$

RfD = cyanotoxin-specific reference dose (0.00005 mg/kg-day)
 BW = body weight = 31.8 kg (EPA, 2019)
 IR = incidental ingestion rate = 0.21 L/day (EPA, 2019)
 CF = conversion factor = 1000 µg/mg

Table A1. Advisory thresholds for saxitoxin set by other U.S. states.

State	Advisory Tier	Saxitoxins (µg/L)
Ohio	Advisory	0.8
Indiana	Human Advisory	0.8
	Human Closure	3
	Dog Closure	0.05
West Virginia	Health Watch	0.8
	Health Warning	3
Pennsylvania	Advisory	0.8
	Avoid Contact	3
Virginia	Advisory	4
Oregon	Advisory	8
	Toxin Advisory	30
Colorado	Advisory	8

Missouri	Advisory	10
Washington	Advisory	75

¹ Aràoz, R., J. Molgo, N.T. de Marsac, 2010. Neurotoxic cyanobacterial toxins. *Toxicon* 56:813-828.

² EFSA, 2009. European Food Safety Authority. Scientific Opinion: Marine biotoxins in shellfish -- Saxitoxin group. *The EFSA Journal* 1019, 1–76.

³ CSWB, 2020. California State Water Boards. Freshwater cyanotoxin producers chart.

⁴ EPA, 2019. U.S. Environmental Protection Agency. Recommended human health recreational ambient water quality criteria or swimming advisories for microcystins and cylindrospermopsin.

⁵ OHA, 2021. Oregon Health Authority. Advisory Guidelines for Harmful Cyanobacteria Blooms in Recreational Waters.