

Blue-Green Algae (Cyanobacteria) Blooms

Last Update: September 18, 2013

Activities at the local, state, national and international level demonstrate an increasing interest in health concerns related to blue-green algae (cyanobacteria) and harmful algal blooms. In response, the [Environmental Management Branch](#) is providing information and links (at bottom of page) to other sites that will be helpful to the public and to local, regional, and state public health and environmental health officials.

→ [Click here for the July 2010 update of the Draft Voluntary Statewide Guidance for Blue-Green Algae in Recreational Water Bodies \(PDF\)](#) 

General Information

What are blue-green algae blooms?

→ Blue-green algae (cyanobacteria) are any of a number of species of microscopic bacteria that are photosynthetic. They may exist as single cells or groups of cells. They occur naturally in surface waters.

→ When conditions are optimal, including light and temperature, levels of nutrients (*i.e.*, phosphorous and nitrogen, and the ratio of the two), and lack of water turbulence, blue-green algae can quickly multiply into a bloom.

→ Blue-green algae blooms are likely to occur more often in warmer months.

What is the concern about blue-green algae blooms?

→ When some blooms occur in water bodies, exposure to the blue-green algae and their toxins can pose risks to humans, pets, livestock and wildlife. Exposure may occur by ingestion, dermal contact, and aspiration or inhalation.

→ Risks to people may occur when recreating in water in which a blue-green algae bloom is present, or from the use of drinking water that uses a surface water source in which a blue-green algae bloom is present.

What are the possible health effects related to blue-green algae blooms?

→ Exposure to blue-green algae can cause rashes, skin and eye irritation, allergic reactions, gastrointestinal upset, and other effects. At high levels, exposure can result in serious illness or death.


→ Depending on the particular cyanobacterium, and the amount to which one is exposed, blue-green algae have the potential to cause a variety of adverse health effects, including liver toxicity (*e.g.*, *Microcystis aeruginosa*) and neurotoxicity (*e.g.*, *Anabaena circinalis*). Microcystin toxins may also promote tumor growth.

→ Destruction of cyanobacteria cells may release the toxins into surrounding waters, so care must be taken in dealing with blue-green algae blooms.

Are these effects just theoretical?

→ No. Several dog deaths have been reported following the dogs' exposure to blue-green algae in Humboldt County, as mentioned in [this press release \(PDF\)](#) 

→ *Microcystis* has been implicated in the deaths of central California southern sea otters, [as discussed in this 2010 paper](#).

→ Worldwide animal poisonings and adverse human health effects have been reported [see links below, especially this [from WHO \(PDF\)](#) ].

Are there any guidelines or risk evaluations available?

→ The WHO guideline for the toxin microcystin LR in drinking water is 1 microgram per liter (µg/L). WHO references are listed below.

→ US EPA's National Center for Environmental Assessment has prepared [draft toxicological reviews of several cyanobacterial toxins](#), anatoxin-a, cylindrospermin, and microcystins (LR, RR, YR, and LA).

→ Cal/EPA's Office of Environmental Health Hazard Assessment (OEHHA) has prepared a [draft toxicological summary and suggested action levels](#) for six cyanotoxins.

Where have blooms occurred recently in California?

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→ Blue-green algal blooms have been reported for a number of water bodies, including: [Klamath River \(PDF\)](#), Siskiyou County | Big Lagoon and Eel River, Humboldt County | [Clear Lake](#), Lake County | Lake Isabella, Kern County | Crowley Lake, Mono County | Lake Elsinore, Riverside County | San Francisco Bay Delta | Stockton Channel, San Joaquin County | [Pinto Lake](#), Santa Cruz County

→ In August 2009 the North Coast Regional Water Quality Control Board issued a press release about toxic blue-green algae for [parts of the Klamath, Eel \(South Fork\) and Van Duzen Rivers in northern California \(PDF\)](#).

Drinking Water

On July 1, 2014, the Drinking Water Program and the Environmental Laboratory Accreditation Program moved from CDPH to the State Water Resources Control Board (SWRCB). Find out more at http://www.waterboards.ca.gov/drinking_water/programs/index.shtml.

What is the best way to minimize risks from blue green algae in drinking water?

→ Avoid drinking untreated surface water. This will protect you not only from blue-green algae, but from *Giardia*, *Cryptosporidium*, and a host of other microbes.

What about drinking water from public water systems?

→ Water systems generally go to great lengths to keep blue-green algae from growing in their surface water supplies, in order to avoid taste and odor problems that would concern their customers. For example, some blue-green algae produce geosmin and MIB (2-methylisoborneol); their earthy, musty odors can be sensed at very low concentrations (on the order of nanograms per liter). The usual good management practices to control taste and odor help reduce the likelihood of toxic blue-green algal blooms.

→ When toxic blue-green algae blooms occur, water systems need to utilize a strategy to treat the blooms that does not merely kill the algae, since rupturing (or lysing) the blue-green algal cells can release their toxins, and treatment may not be entirely effective in removing toxins.

What is the regulatory status of blue-green algae in drinking water?

→ There aren't any drinking water standards specifically for blue-green algae, but "blue green algae (cyanobacteria), other freshwater algae, and their toxins" were included on the second federal [Drinking Water Contaminant Candidate List](#) (CCL2). EPA uses the CCL to prioritize research and data collection efforts to help determine whether a specific contaminant ought to be regulated.

Recreational Water

More about CDPH's recreational health programs is [here](#).

What is the best way to minimize risks from blue green algae in recreational water?

→ Avoid body contact with blue-green algal blooms. This includes swimming, wading, water-skiing.

→ Children especially should avoid contact. Their small body weight means their exposures to blue green algae will be higher than adults, given the same volume of water intake.

→ Local health and environmental agencies are encouraged to and generally do post recreational areas with signs and brochures to inform the public of the presence of blue-green algae blooms. Some examples of information from various states are presented below.

What about fish caught in water experiencing a blue-green algae bloom?

→ If one is going to consume fish, it's best to remove the internal organs, which would likely contain more of the algae/toxin.

→ There have been some reports of blue-green algae toxin in fish tissues [for example, see the [SWRCB's 2008 report on cyanotoxin in yellow perch and shellfish in the Klamath River \(PDF\)](#)]. However, anadromous fish that are migrating into a water body with a bloom may not have had an opportunity to concentrate much of the toxin.




What about pets?

→ Keep pets out of water with blue-green algae blooms.



→ Dog deaths have been reported, some apparently related to ingestion associated with licking algae from their fur after wading/swimming in water with blue-green algae blooms.

What is the regulatory status of blue-green algae in recreational water?

→ There aren't any state or federal standards for blue-green algae in recreational water.

- » California has developed draft voluntary guidance for recreational water bodies -- [the latest draft \(July 2010\) is here \(PDF\)](#) .
- » CDPH discusses blue-green algae in its [guidance for freshwater beaches](#).
- » The WHO has developed [guidelines \(PDF\)](#)  for recreation, which are summarized in [this table \(PDF\)](#) .

References

- WHO, 1999. [Toxic Cyanobacteria in Water: A Guide to their Public Health Consequences, Monitoring and Management](#). World Health Organization, Geneva
- WHO, 2003. [Guidelines for Safe Recreational Water Environments, Vol. 1, Coastal and Fresh Water](#), World Health Organization, Geneva.
- WHO, 2004. [Microcystin LR \(PDF\)](#) , from [Chemical Fact Sheets, Guidelines for Drinking Water \(PDF\)](#) , World Health Organization, Geneva.

More Information

What are other states doing about blue-green algae?

Some other states provide informational materials about blue-green algae and/or other algal blooms, including the following:

[Florida](#) | [Indiana](#) | [Maine](#) | [Maryland](#) | [Massachusetts](#) | [Michigan \(PDF\)](#)  | [Minnesota](#) | [Nebraska](#) | [New Hampshire](#) | [New York](#) | [North Carolina](#) | [Ohio](#) | [Oregon](#) | [Texas](#) | [Vermont](#) | [Washington](#) | [Wisconsin](#)

Where Can I Learn More?

- [Blue-Green Algae Tri Fold Brochure](#)
- [Guidance on blue-green algae in recreational water bodies \(PDF, New Window\)](#)
State-wide guidance from SWRCB, CDPH, and OEHHA, dated July 2010.
- [SWRCB's blue-green algae page](#)
Information from the State Water Resource Control Board.
- [OEHHA's information on microcystins](#)
Includes a report on toxicity and effects, with special reference to fish, wildlife, and livestock; a factsheet; and list of references.
- [OEHHA's draft toxicologic summary for cyanobacteria](#)
Includes actions levels to reduce potential adverse health effects for six cyanobacteria.
- [CDC's blue-green algae web site](#)
The Centers for Disease Control and Prevention's information on blue-green algae.
- [NOAA's Harmful Algae Page](#)
The National Oceanic and Atmospheric Administration's information on harmful algal blooms.
- [NCEA's toxicological reviews of several cyanobacterial toxins](#)
Evaluations by the National Center for Environmental Assessment.
- [The WHO's Toxic Cyanobacteria in Water Guidance](#)
The World Health Organization's Guide to BGA's Public Health Consequences, Monitoring and Management.
- [Introduction to the ISOC-HAB](#)
US EPA's information about the International Symposium on Cyanobacterial Harmful Algal Blooms.
- [ISOC-HAB Proceedings \(PDF, 11.2MB, New Window\)](#)
Proceedings from the 2005 symposium, published in 2007.
- [US EPA's Cyanobacterial Harmful Algal Blooms \(CyanoHABs\) Information](#)
- [USGS Kansas Algal Toxins Research Team](#)
BGA Blooms: Tastes, Odors, and Toxins; plus links to more

Other Cyanobacteria Sites

- [Cyanosite](#)
A webserver for cyanobacterial research (Purdue University).
- [Introduction to Cyanobacteria](#)
Information from UC Berkeley's Museum of Paleontology.
- [NALMS' Blue-Green Algae Pages](#)
The North American Lake Management Society's blue-green algae information.
- [Toxic algal blooms – A sign of rivers under stress](#)
Material from the Australian Academy of Science.
- [Blue-Green Algae \(Cyanobacteria\) in Inland Waters: Assessment and Control of Risks to Public Health \(Scottish Executive Health Department\).](#)
- [Current approaches to cyanotoxin risk assessment, risk management, and regulations \(PDF, 2.47MB, New Window\)](#)
A summary of interanational activities, from the Federal Environmental Agency, Germany.

Laboratories

- Commercial Laboratories**
- In response to inquiries about laboratories that can assist local agencies in the identification of blue-green algae and monitoring for algal cells and toxins, CDPH offers the following:
 - [GreenWater Laboratories/Cyanolab](#)
Palakta, Florida: 1-877-869-2542 (toll free), or (386) 328-0882.
 - [California Animal Health & Food Safety Laboratory System](#)
University of California, Davis: (530) 752-8700 — analysis for microcystins and anatoxin-a in animal stomach contents, and other animal-related analyses.
 - [Abraxis](#)
Warminster, Pennsylvania: (215) 357-3911 — test kits.
 - [Beacon Analytical Systems, Inc.](#)
Portland, Maine: (207) 761-2199 — test kits.
 - [Envirologix](#)
Portland, Maine: (866) 408-4597 or (207) 797-0300 — test kits.

information.

[USGS Podcast: Slimy Summer Swimming: Harmful Algal Blooms in Lakes, Rivers and Streams](#)

Prior Correspondence from DDWEM (now State Water Board)

[To public water systems \(PWS\) \(PDF, New Window\)](#)

DDWEM's (now State Water Board) letter to PWS with surface water sources of drinking water.

[To local primacy agencies \(LPAs\) \(PDF, New Window\)](#)

DDWEM's (now State Water Board) letter to LPAs that regulate PWS with surface water sources.

[To county officials \(PDF, New Window\)](#)

DDWEM's (now State Water Board) letter to county health officers and environmental health directors.