



# BEAR CREEK WATERSHED

Fact Sheet 57 Cyanobacteria and Cyanotoxins  
October 11, 2018

The Bear Creek Watershed Association protects and restores water and environmental quality within the Bear Creek Watershed from the effects of land use.

## 2018 Membership

Clear Creek County  
Jefferson County  
City of Lakewood  
Town of Morrison  
Aspen Park Metropolitan District  
Conifer Sanitation Association  
Conifer Metropolitan District  
Denver Water Department  
Evergreen Metropolitan District  
Forrest Hills Metropolitan District  
Genesee Sanitation & Water District  
Geneva Glen  
Jefferson County School District  
Kittredge Water & Sanitation District  
Tiny Town Foundation, Inc.  
West Jefferson County Metro District

- Cyanobacteria have been around for about 400 million years.
- Cyanobacteria can grow rapidly and form dense layers, called algal mats.
- Not all cyanobacteria blooms produce toxins.
- Urbanization has increased cyanobacteria bloom frequency, intensity and distribution in freshwaters.
- Increases in urbanization and agricultural uses include higher nitrogen and phosphorus released into waterways promoting algal blooms.
- Blooms can produce odor and taste compounds and make water non-potable, while not toxic, definitely a public nuisance.
- Cyanotoxins in higher concentrations are a public health concern and can be harmful to livestock and pets.

Blue-green algae, also called cyanobacteria are found in Colorado freshwaters and are especially common in lakes or reservoirs, like Bear Creek Reservoir. Elevated concentrations of cyanobacteria maybe harmful to the environment, animals and even human health. Blue-green algae sometimes appear as dense mats that can impede activities like swimming and fishing. These types of algae may cause taste, color or odor problems in drinking water. When algae die and decompose, they contribute to oxygen depletion in lakes or reservoirs.

Cyanobacteria, in high concentrations (> 20,000 cells/ml of water), can produce toxins. Release of toxins during an algal bloom generally occurs when algal cells die or are subject to lysis (i.e., cell wall ruptures). Most commonly occurring genera of blue-greens found in Bear Creek Reservoir over the last 10-years are Microcystis, Anabaena, Oscillatoria, and Aphanizomenon. Potential cyanotoxins found in reservoir blooms are microcystins, cylindrospermopsin, anatoxins and saxitoxins.

There are no federal regulations for cyanotoxins in drinking water, although some states (22) and countries have developed drinking water standards and recreational guidelines. Colorado has no cyanotoxin standards, but has issued health advisory guidance (<https://www.colorado.gov/pacific/cdphe/harmful-algae-blooms>). Reported cyanotoxin health effects include gastroenteritis and liver and kidney damage in humans following exposure to cyanotoxins in drinking water. Recreational exposure to cyanobacterial blooms may lead to allergic reactions, including hay fever-like symptoms, skin rashes, and gastrointestinal distress. Animal studies show long-term adverse effects from cyanotoxins include liver and kidney damage.

For drinking water, the provisional World Health Organization (WHO) Guideline value for microcystin-LR of 1 µg/L (or the underlying Tolerable Daily Intake (TDI) of 0.04 µg/kg) has been widely used worldwide as the basis for national standards or recreational guidelines. Livestock and pets can potentially be exposed to higher concentrations of cyanobacterial toxins than humans because they are more likely to consume shoreline algal mats while drinking cyanobacteria-contaminated water. Dogs are particularly at risk when licking cyanobacteria from their fur after swimming in water with an ongoing bloom.

A density of >100,000 cyanobacterial cells per ml or 50 µg/L of chlorophyll *a* (when cyanobacteria dominate) is a WHO guideline for a moderate health

alert in recreational waters. If the bloom consists of Microcystis, then the water could contain a concentration of about 20 µg/L of microcystins. A low toxin potential occurs when a cell count of >20,000 cells and < 100,000 cells of cyanobacteria per ml or 10-20 µg/L chlorophyll is measured and there is a dominance of cyanobacteria. Contact with this bloom concentration may cause short-term adverse health outcomes, e.g. skin irritations and gastrointestinal distress. Cell counts below 20,000 cells/ml of cyanobacteria pose little risk of toxin exposure.

-	Average Density, cells/ml	Monthly High Average	Potential Toxin Risk
2007	1,780	11,500 <sup>Mi</sup>	Very low
2008	5,230	121,000 <sup>GI</sup>	Moderate
2009	1,415	2,960 <sup>An</sup>	Very low
2010	274	945 <sup>Mi</sup>	Very low
2011	8,660	8,350 <sup>Ap</sup>	Very low
2012	540	15,500 <sup>Ap</sup>	Very low
2013	1,380	3,170 <sup>Ap</sup>	Very low
2014	4,660	32,100 <sup>Mi</sup>	Low
2015	69	195 <sup>An</sup>	Very low
2016	14,800	57,100 <sup>Mi</sup>	Low
2017	22,780	75,154 <sup>MI</sup>	Moderate
<sup>Ap</sup>	Aphanizomenon		
<sup>Mi</sup>	Microcystis		
<sup>An</sup>	Anabaena		
<sup>Os</sup>	Oscillatoria		
<sup>GI</sup>	Gloeotrichia		