



BEAR CREEK WATERSHED

Fact Sheet 69 Diatom Assemblages in Bear Creek Reservoir February 2020

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

Membership

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

	Bear Creek Reservoir							
	Total	2013	2014	2015	2016	2017	2018	2019
Species	83	41	44	31	49	12	39	38
Genera	25	19	16	14	17	10	18	14

Diatoms in Bear Creek Reservoir can tell us about the current health and potential changes to the trophic state of this aquatic system. Diatoms are a type of phytoplankton with porous silica cell walls. Diatoms have been around since the Jurassic Period

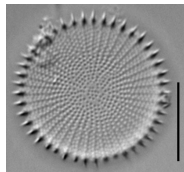
and are found worldwide. These diverse plankton are easily transported from different aquatic systems. Species of diatoms found in Colorado waters are also found across the country with some species having European origins (See BCWA Fact Sheet 67 Diatoms as Water Quality Indicators and Fact Sheet 68 Diatoms Evergreen Lake).

There is over 25-years of phytoplankton record for Bear Creek Reservoir. Many of the diatoms found in Bear Creek Reservoir are representative of a Eutrophic or high nutrient waterbody. While the diatom assemblage in the reservoir only averages about 13% of the total phytoplankton community on an longer term annual basis, the assemblage comprises the greatest species diversity over the same time period averaging 69%. In recent years the biovolume of diatoms has increased significantly in the reservoir.

In 2019, the three largest phytoplankton blooms were caused by diatoms with *Fragilaria crotonensis* (Shown right) having a peak measured biovolume of 2.28 million $\mu\text{m}^3/\text{mL}$. This density of diatoms made the reservoir appear muddy and greatly reduced the Secchi measurements (depth of light penetration) to 1.4 meters; by September the Secchi measurements were less than 1 meter, indicating hyper-eutrophic conditions. *Fragilaria crotonensis* occurs in some alpine Rocky Mountain lakes, but has not yet been recorded for Evergreen Reservoir.

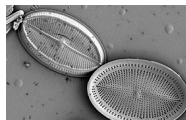


Bear Creek Reservoir		
Seasonal Diatoms	Total Biovolume	Species Diversity
2013	25%	72%
2014	6%	71%
2015	5%	49%
2016	1%	80%
2017	20%	67%
2018	14%	71%
2019	18%	72%

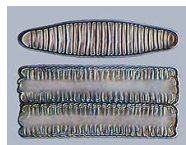


Stephanodiscus hantzschii is characteristic of numerous eutrophic lakes across the country, especially those with higher total phosphorus concentrations, and under silica limitation. Blooms of *S. hantzschii* regularly occur in Pike View Reservoir, Colorado Springs, CO. The diatom is known to clogs the membranes at the water treatment plants. *S. hantzschii* is a long-term resident of Bear Creek Reservoir with generally smaller blooms occurring in early summer, but can bloom under ice conditions. This diatom is generally considered an indicator of eutrophication, flourishes worldwide in most rivers, reservoirs and lakes during periods of water shortage and low temperatures. *Stephanodiscus* is one of the most diverse and widespread genera of planktonic diatoms in North America and the northern hemisphere.

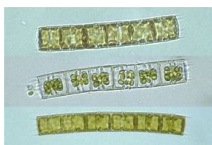
Cocconeis placentula (shown below) and *Achnanthes minutissima* have been recorded annually in Bear Creek Reservoir since 1999. These diatoms are widely distributed in western lakes and reservoirs. They are associated with nutrient enriched waters and are indicators of eutrophication.



Diatoma vulgare (shown below) is another diatom characteristic of nutrient enriched waterbodies. This Diatom first was recorded in Bear



Creek Reservoir in August 2016 with a bloom biovolume of 813,914 $\mu\text{m}^3/\text{mL}$. In July 2017 and October 2018, this diatom had major biovolume blooms of 2,071,781 and 2,623,626 $\mu\text{m}^3/\text{mL}$, respectively. In 2019, the bloom maximum was only 63,140 $\mu\text{m}^3/\text{mL}$.



Melosira granulata (Shown left) and *Melosira ambigua* are frequent diatoms in the Bear Creek reservoir assemblage. These diatoms are widely spread in lakes, reservoirs and slow moving waters across the western states and are associated with nutrient enriched waterbodies.

2019 Dominate Species BCR	Functional Group	Peak Density #/ml	Peak Biovolume $\mu\text{m}^3/\text{mL}$
<i>Microcystis aeruginosa</i>	Bluegreen	38,843	372,893
<i>Achnanthes deflexa</i>	Diatom	8,328	1,499,063
<i>Fragilaria crotonensis</i>	Diatom	209	2,280,056
<i>Melosira ambigua</i>	Diatom	626	1,254,406

Bear Creek Reservoir Major Species	Potential Pollution Indicator	Maximum Biovolume $\mu\text{m}^3/\text{mL}$	Frequency 2013-2019
<i>Asterionella formosa</i>	Eutrophic	132,666	71%
<i>Diatoma vulgare</i>	Eutrophic	2,623,626	57%
<i>Fragilaria crotonensis</i>	Eutrophic	2,280,056	71%
<i>Fragilaria vaucheria</i>	Eutrophic	83,035	57%
<i>Melosira ambigua</i>	Eutrophic	85,552	86%
<i>Melosira granulata</i>	Eutrophic	704,231	71%
<i>M. granulata angustissima</i>	Eutrophic	37,724	71%
<i>Stephanodiscus hantzschii</i>	Eutrophic	87,340	100%
<i>Stephanodiscus niagarae</i>	Eutrophic	933,103	86%
<i>Achnanthes lanceolata</i>	High Nutrients	17,648	86%
<i>Achnanthes linearis</i>	High Nutrients	2,310	86%
<i>Cocconeis placentula</i>	High Nutrients	93,318	100%
<i>Synedra ulna</i>	Eutrophic	36,662	71%
<i>Cymbella minuta</i>	Eutrophic	54,991	86%
<i>Achnanthes minutissima</i>	Tolerate Metals	5,719	100%