



BEAR CREEK WATERSHED

Fact Sheet 68 Diatoms Assemblages in Evergreen Lake 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
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The planktonic diatom *Asterionella formosa* can have undesirable cyclic effects from the water management point of view. The population dynamics of this algal species depends on both the morphometric features and the hydraulic mode of management (retention time) in reservoirs, as well as on the physical (temperature, suspended matter) and chemical (nitrogen, silica, calcium) characteristics of the water. A widespread increase in the relative abundances of *Asterionella formosa* and *Fragilaria crotonensis* has occurred in alpine and temperate lakes across the western United States. Previous investigations have suggested that enhanced atmospheric nitrogen (N) deposition is driving these shifts in diatom community structure. These two taxa are indicative of phosphorus enrichment in lakes and reservoirs. The population densities of species like *Melosira ambigua*, or *Fragilaria construens* indicate eutrophic conditions.

Diatoms in Evergreen Lake, a direct use water supply, 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). Some of the diatoms in Evergreen Lake are suggestive of a waterbody at the Mesotrophic/ Eutrophic boundary. The Walker eutrophication scale suggest Evergreen has already tipped toward eutrophic (Walker 2019 value was 52.4; eutrophic is 50-65).

Some diatoms like *Asterionella formosa* can lead to clogging of filters in water treatment plants, thereby drastically reducing the length of filter runs and necessitating frequent backwashings. During significant blooms, clogging may require more water to backwash than the amount of filtered water produced, diminishing the efficiency and cost-effectiveness of the treatment process. *Synedra* is a large genus related to *Fragilaria* and comprised of elongated linear or commonly needle-shaped solitary or loosely colonial diatoms that may cause earthy odors in water supplies. *Synedra* prefers nutrient-rich, or sodium-sulfate waters with elevated conductivity.

Some diatom species like *Achnanthes minutissima*, *Gomphonema angustatum*, or *Cymbella minuta* can be indicators of well-oxygenated, clean water with good flows. *Achnanthes minutissima* is a widely adaptable taxon and is found throughout the west in various aquatic environments. This diatom was found to have a specific tolerance to heavy metals (Cu, Zn, Pb, and Cd etc.). the higher the

concentration of heavy metals in a river environment, the higher the relative abundance of *Achnanthes minutissima*. Thus, this species can be used as a bioindicator of heavy metal pollution/ loadings. This species is a cosmopolitan diatom with a very broad ecological amplitude. It is an attached diatom and often the first species to pioneer a recently scoured site, sometimes to the exclusion of all other algae. The percent abundance of *A. minutissima* has been found to be directly proportional to the time that has elapsed since the last scouring flow or episode of toxic pollution.

Diatom	Evergreen Lake		
	Total	2018	2019
Species	37	11	32
Genera	17	11	17

EGL Species List	Morphology	Potential Pollution Indicator
<i>Navicula anglica</i>	Symmetric Biraphid	Common Clean Water
<i>Navicula cryptocephala</i>	Symmetric Biraphid	Common Clean Water
<i>Navicula decussis</i>	Symmetric Biraphid	Common Clean Water
<i>Navicula minima</i>	Symmetric Biraphid	Common Clean Water
<i>Navicula minuscula</i>	Symmetric Biraphid	Common Clean Water
<i>Navicula pupula</i>	Symmetric Biraphid	Common Clean Water
<i>Navicula tripunctata</i>	Symmetric Biraphid	Common Clean Water
<i>Navicula viridula</i>	Symmetric Biraphid	Common Clean Water
<i>Asterionella formosa</i>	Araphid	Eutrophic
<i>Cymbella microcephala</i>	Asymmetric Biraphid	Eutrophic
<i>Fragilaria construens venter</i>	Araphid	Eutrophic
<i>Fragilaria pinnata</i>	Araphid	Eutrophic
<i>Fragilaria vaucheria</i>	Araphid	Eutrophic
<i>Melosira ambigua</i>	Centric	Eutrophic
<i>Melosira granulata</i>	Centric	Eutrophic
<i>Synedra ulna</i>	Araphid	Eutrophic
<i>Achnanthes lanceolata</i>	Monoraphid	High Nutrient Water
<i>Achnanthes linearis</i>	Monoraphid	High Nutrient Water
<i>Cocconeis placentula</i>	Monoraphid	High Nutrient Water
<i>Gomphonema angustatum</i>	Asymmetric Biraphid	Higher Oxygen
<i>Gomphonema subclavatum</i>	Asymmetric Biraphid	Higher Oxygen
<i>Cymbella minuta</i>	Asymmetric Biraphid	Mesotrophic/Eutrophic
<i>Hannaea arcus</i>	Araphid	Mesotrophic/Eutrophic
<i>Nitzschia dissipata</i>	Nitzschioid	Nutrient Rich Water
<i>Nitzschia frustulum</i>	Nitzschioid	Nutrient Rich Water
<i>Nitzschia palea</i>	Nitzschioid	Nutrient Rich Water
<i>Synedra cyclopus</i>	Araphid	Odor Water Supply
<i>Synedra rumpens</i>	Araphid	Odor Water Supply
<i>Rhoicosphenia curvata</i>	Asymmetric Biraphid	Origin Lake Powell
<i>Achnanthes clevei</i>	Monoraphid	Phosphorus enrichment
<i>Achnanthes marginulata</i>	Monoraphid	Phosphorus enrichment
<i>Diatoma tenue</i>	Araphid	Phosphorus enrichment
<i>Cyclotella stelligera</i>	Centric	Sensitive Temperature
<i>Amphora perpusilla</i>	Symmetric Biraphid	Shade Tolerant
<i>Achnanthes minutissima</i>	Monoraphid	Tolerant Metals
<i>Caloneis ventricosa minuta</i>	Symmetric Biraphid	Warmer Water
<i>Pinnularia</i> sp.	Symmetric Biraphid	
<i>Pinnularia</i> sp.		