

# Technical Memorandum BCWA

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**Date:** February 5, 2020  
**To:** Bear Creek Watershed Association  
**From:** Russell N. Clayshulte, Manager  
**Re:** BCWA TM 2019.09 BCR Phytoplankton Summary

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Phytoplankton samples are taken at the Site 40 buoy in BCR for the July, August, September, and October sample periods. The samples are 1-liter composites taken at -1 meter. Samples are taken for laboratory analyses. This resulted in 5 sample sets. The phytoplankton summary data provides general species composition, average biodensity and average total density. The *BCWA MSD17 Phytoplankton Master* spreadsheet maintains the full phytoplankton record and data analyses.



**Figure 1** Phytoplankton Sampled at Site 40 in Center of Reservoir



**Table 1 BCR Average Phytoplankton for Monitoring Season**

	<b>June through September 2019 Seasonal Average</b>				
	<b>Density #/ml</b>	<b>Density %</b>	<b>Biovolume um3/mL</b>	<b>Biovolume %</b>	<b>Group</b>
Anabaena flos-aquae	97	0.3	148,927	11.4	bluegreen
Aphanizomenon flos-aquae	377	1.0	401,867	36.2	bluegreen
Microcystis aeruginosa	36,737	96.3	366,524	35.1	bluegreen
Dinobryon sertularia	77	4.5	13,137	2.1	chrysophyte
Lagynion sp.	13	0.7	822	0.0	chrysophyte
Mallomonas sp.	23	1.4	8,834	2.1	chrysophyte
Cryptomonas erosa	189	10.3	98,279	20.8	chrysophyte
Rhodomonas minuta	222	11.5	4,442	1.0	chrysophyte
Achnanthes deflexa	8,328	84.7	1,499,063	61.0	diatom
Achnanthes lanceolata	29	0.3	5,194	0.4	diatom
Achnanthes linearis	72	0.4	9,564	0.8	diatom
Achnanthes minutissima	114	1.4	5,719	0.5	diatom
Amphora ovalis	32	0.3	18,514	0.8	diatom
Amphora perpusilla	515	1.4	85,561	6.6	diatom
Asterionella formosa	236	12.0	158,401	3.9	diatom
Cocconeis placentula	32	0.2	14,776	0.9	diatom
Cymbella mexicana	32	0.3	176,172	7.2	diatom
Cymbella microcephala	32	0.3	1,698	0.1	diatom
Cymbella minuta	39	0.5	14,481	1.9	diatom
Diatoma tenue	21	0.3	6,234	0.7	diatom
Diatoma vulgare	32	0.1	63,140	4.8	diatom
Fragilaria capucina mesolepta	64	0.7	16,336	0.7	diatom
Fragilaria construens	37	0.2	10,007	0.7	diatom
Fragilaria leptostauron	21	0.1	3,800	0.4	diatom
Gomphonema acuminatum	64	0.7	111,469	4.5	diatom
Gomphonema angustatum	160	1.6	28,828	1.2	diatom
Gomphonema subclavatum	64	0.7	38,438	1.6	diatom
Gomphonema truncatum	32	0.3	43,563	1.8	diatom
Melosira ambigua	329	17.6	646,070	13.9	diatom
Melosira granulata	206	10.9	497,605	14.6	diatom
Navicula cryptocephala	48	0.3	8,923	0.6	diatom
Navicula cryptocephala veneta	12	0.7	1,104	0.3	diatom
Navicula minima	32	0.3	1,409	0.1	diatom
Navicula minuscula	12	0.7	523	0.1	diatom
Navicula tripunctata	32	0.3	35,875	1.5	diatom
Nitzschia amphibia	32	0.1	3,093	0.2	diatom
Nitzschia capitellata	128	1.3	46,125	1.9	diatom
Nitzschia dissipata	32	0.3	8,616	0.4	diatom
Nitzschia frustulum	32	0.3	3,844	0.2	diatom
Pinnularia sp.	12	0.7	4,649	1.1	diatom
Stephanodiscus hantzschii	21	0.1	8,260	0.9	diatom
Synedra mazamaensis	116	6.8	13,948	3.3	diatom
Synedra radians	128	1.3	32,800	1.3	diatom
Synedra rumpens	32	0.3	11,531	0.5	diatom
Synedra ulna	128	1.3	17,938	0.7	diatom
Trachelomonas scabra	64	0.7	127,484	5.2	euglenoid
Ankistrodesmus falcatus	43	0.5	1,075	0.1	green
Chlamydomonas sp.	32	0.1	10,470	0.8	green
Pediastrum boryanum	12	0.7	4,649	1.1	green
Sphaerocystis Schroeteri	12	0.7	5,281	0.5	green
Ulothrix sp.	32	0.3	5,125	0.2	green

**Table 2 BCR Phytoplankton Summary by Sample Set**

	10-Jun-19	15-Jul-19	5-Aug-19	9-Sep-19
<b>Total Density (#/mL):</b>	1,697	1,801	9,834	36,724
<b>Total Biovolume (um<sup>3</sup>/mL):</b>	421,522	4,792,068	2,458,366	1,304,969
<b>Trophic State Index:</b>	43.6	61.1	56.3	51.8

**Table 3 BCR Species Diversity, Density and Biovolume by Functional Group**

Functional Group	Species	Seasonal Ave Density #/ml	Seasonal Ave Biovolume, um <sup>3</sup> /mL
bluegreen	3	12,403	305,773
chrysophyte	5	105	25,103
diatom	36	305	98,737
euglenoid	1	64	127,484
green	5	26	5,320

**Table 4 BCR Dominate Species During Seasonal Sampling**

Species with >100,000 Biovolume um <sup>3</sup> /mL	
Anabaena flos-aquae	Bluegreen
Aphanizomenon flos-aquae	
Microcystis aeruginosa	
Cryptomonas erosa	chrysophyte
Achnanthes deflexa	Diatom
Asterionella formosa	
Cymbella mexicana	
Fragilaria crotonensis	
Melosira ambigua	
Melosira granulata	
Synedra ulna	euglenoid
Trachelomonas scabra	

**Table 5 BCR Peak Species Density and Biovolume**

Species	Peak Density #/ml	Peak Biovolume um <sup>3</sup> /mL
Microcystis aeruginosa	38,843	372,893
Achnanthes deflexa	8,328	1,499,063
Fragilaria crotonensis	209	2,280,056
Melosira ambigua	626	1,254,406

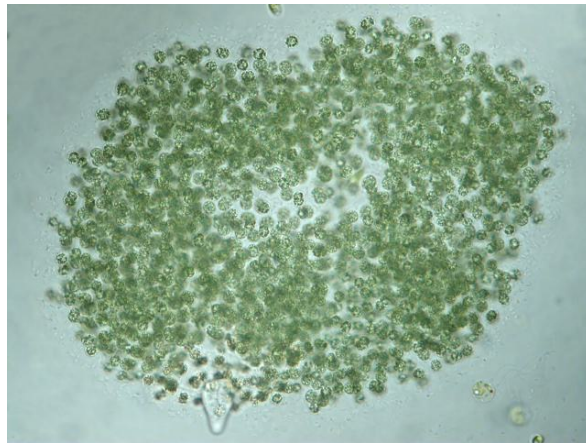


Figure 2 *Microcystis aeruginosa*

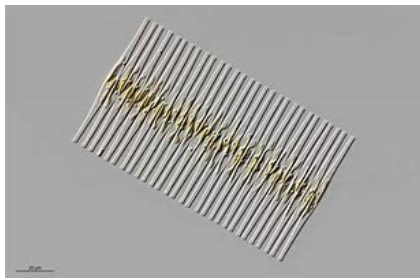


Figure 3 *Fragilaria crotonensis*

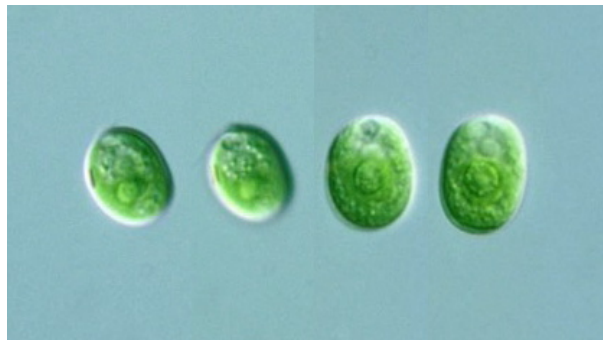


Figure 4 *Cryptomonas erosa*

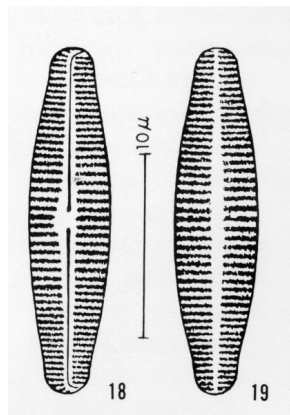


Figure 5 *Achnanthes deflexa*

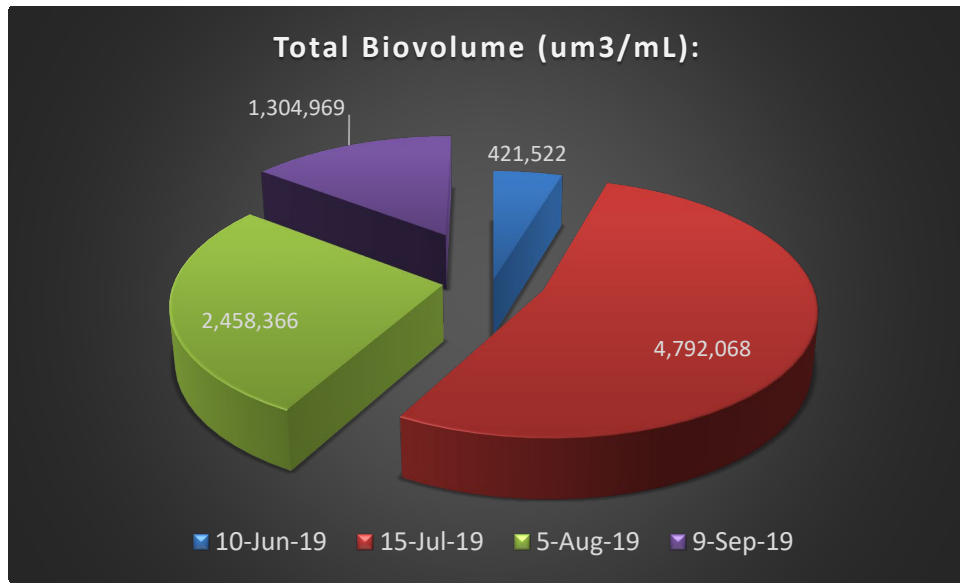


Figure 6 Seasonal Average Biovolumes by Functional Groups

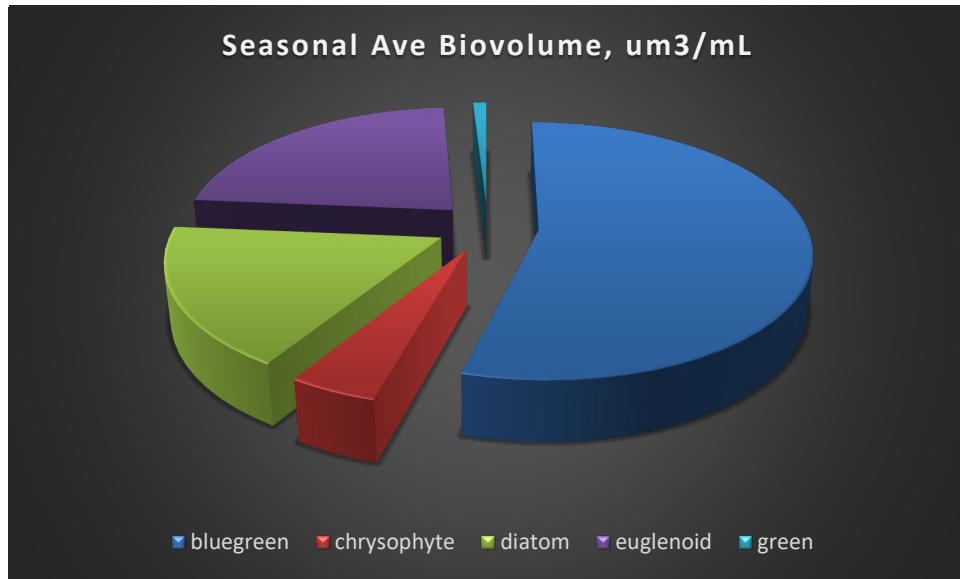


Figure 7 Phytoplankton Species Diversity

Table 6 EGL Species Data 2019

Species	Density #/ml	Density %	Biovolume um <sup>3</sup> /mL	Biovolume %	Group
8/14/2019 Chrysococcus rufescens	7	1.1	579	0.5	chrysophyte
Kephyrion sp.	7	1.1	429	0.3	chrysophyte
Cryptomonas erosa	41	6.8	21,243	16.8	cryptophyte
Rhodomonas minuta	95	15.9	1,906	1.5	cryptophyte
Achnanthes clevei	7	1.1	1,021	0.8	diatom
Achnanthes lanceolata	14	2.3	2,451	1.9	diatom
Achnanthes linearis	20	3.4	2,696	2.1	diatom
Achnanthes marginulata	7	1.1	647	0.5	diatom
Achnanthes minutissima	259	43.2	12,936	10.3	diatom
Asterionella formosa	27	4.5	7,190	5.7	diatom
Caloneis ventricosa minuta	7	1.1	1,906	1.5	diatom
Cymbella minuta	41	6.8	15,115	12.0	diatom

	Species	Density #/ml	Density %	Biovolume um <sup>3</sup> /mL	Biovolume %	Group	
	Fragilaria vaucheria	7	1.1	1,961	1.6	diatom	
	Hannaea arcus	14	2.3	23,830	18.9	diatom	
	Melosira granulata	14	2.3	14,979	11.9	diatom	
	Navicula minuscula	7	1.1	306	0.2	diatom	
	Navicula tripunctata	14	2.3	15,251	12.1	diatom	
	Rhoicosphenia curvata	7	1.1	797	0.6	diatom	
	Synedra rumpens	7	1.1	953	0.8	diatom	
9/11/2019	Kephyrion sp.	31	2.2	1,973	0.2	chrysophyte	
	Kephyrion spirale	94	6.5	5,919	0.5	chrysophyte	
	Cryptomonas erosa	47	3.3	24,429	2.1	cryptophyte	
	Rhodomonas minuta	94	6.5	1,879	0.2	cryptophyte	
	Achnanthes linearis	31	2.2	4,134	0.3	diatom	
	Achnanthes minutissima	78	5.4	4,698	0.4	diatom	
	Asterionella formosa	814	56.5	716,589	60.4	diatom	
	Cyclotella stelligera	16	1.1	861	0.1	diatom	
	Cymbella minuta	47	3.3	17,382	1.5	diatom	
	Fragilaria pinnata	16	1.1	940	0.1	diatom	
	Melosira ambigua	78	5.4	285,931	24.1	diatom	
	Melosira granulata	47	3.3	85,267	7.2	diatom	
	Nitzschia dissipata	16	1.1	4,212	0.4	diatom	
	Synedra ulna	16	1.1	31,163	2.6	diatom	
	Tetraedron minimum	16	1.1	705	0.1	green	
	7/10/2019	Chrysococcus rufescens	30	3.9	2,583	1.0	chrysophyte
		Dinobryon sertularia	15	1.9	1,823	0.7	chrysophyte
		Kephyrion sp.	15	1.9	957	0.4	chrysophyte
Cryptomonas erosa		99	12.6	51,361	19.5	cryptophyte	
Rhodomonas minuta		61	7.8	1,216	0.5	cryptophyte	
Achnanthes lanceolata		8	1.0	1,368	0.5	diatom	
Achnanthes linearis		23	2.9	3,009	1.1	diatom	
Achnanthes minutissima		213	27.2	10,637	4.0	diatom	
Amphora perpusilla		15	1.9	2,522	1.0	diatom	
Cocconeis placentula		8	1.0	3,495	1.3	diatom	
Cymbella microcephala		8	1.0	403	0.2	diatom	
Cymbella minuta		23	2.9	8,433	3.2	diatom	
Diatoma tenue		23	2.9	6,610	2.5	diatom	
Fragilaria construens venter		15	1.9	729	0.3	diatom	
Fragilaria vaucheria		46	5.8	13,129	5.0	diatom	
Gomphonema angustatum		15	1.9	2,735	1.0	diatom	
Hannaea arcus		15	1.9	26,592	10.1	diatom	
Melosira ambigua		8	1.0	13,425	5.1	diatom	
Melosira granulata		23	2.9	87,754	33.3	diatom	
Navicula anglica		8	1.0	2,735	1.0	diatom	
Navicula cryptocephala		8	1.0	1,406	0.5	diatom	
Navicula decussis		15	1.9	2,918	1.1	diatom	
Navicula minima		8	1.0	334	0.1	diatom	
Navicula pupula		8	1.0	2,051	0.8	diatom	
Nitzschia dissipata		15	1.9	4,088	1.6	diatom	
Nitzschia frustulum		15	1.9	1,823	0.7	diatom	
Nitzschia palea		15	1.9	2,735	1.0	diatom	

Species	Density #/ml	Density %	Biovolume um <sup>3</sup> /mL	Biovolume %	Group
Pinnularia sp.	8	1.0	3,039	1.2	diatom
Synedra rumpens	15	1.9	2,127	0.8	diatom
Scenedesmus quadricauda	8	1.0	1,482	0.6	green

**Table 7 EGL Density and Biovolume by Sample Set**

	10-Jul-19	14-Aug-19	11-Sep-19
<b>Total Density (#/mL):</b>	783	599	1,441
<b>Total Biovolume (um<sup>3</sup>/mL):</b>	263,519	126,197	1,186,083
<b>Trophic State Index:</b>	40.2	35.0	51.1
<b>Total Species</b>	30	19	16
diatom	24	14	11
cryptophyte	2	2	2
chrysophyte	3	2	2
green	1		1

**Table 8 EGL Dominate Species**

Species	Group
Cryptomonas erosa	cryptophyte
Achnanthes minutissima	diatom
Fragilaria vaucheria	diatom
Hannaea arcus	diatom
Melosira ambigua	diatom
Melosira granulata	diatom
Asterionella formosa	diatom
Synedra ulna	diatom
Navicula tripunctata	diatom