

TECHNICAL MEMORANDUM BCWA

To: *Bear Creek Watershed Association*
From: Russell N. Clayshulte, Manager

Re: **TM 2014.10- BCR Phytoplankton Summary**



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Figure 1 BCR Phytoplankton Samples Taken at BCWA Site 40, Middle of the Reservoir

Table 1 Phytoplankton Species present in 2014

Species	Density #/ml	Density, %	Biovolume, $\mu\text{m}^3/\text{mL}$	Biovolume, %	Group
<i>Anabaena flos-aquae</i>	16.3	3.7	39182.6	5.4	bluegreen
<i>Anabaena flos-aquae</i>	15.6	3.0	35868.8	5.6	bluegreen
<i>Aphanizomenon flos-aquae</i>	16.2	3.2	22485.1	3.1	bluegreen
<i>Aphanizomenon flos-aquae</i>	120.4	24.0	149436.3	22.3	bluegreen
<i>Aphanizomenon flos-aquae</i>	165.9	11.8	454538.3	41.0	bluegreen
<i>Aphanizomenon flos-aquae</i>	74.6	0.6	105400.9	7.1	bluegreen
<i>Microcystis aeruginosa</i>	32217.5	50.1	283655.6	18.4	bluegreen
<i>Chrysococcus rufescens</i>	4.3	2.5	365.1	0.1	chrysophyte
<i>Dinobryon sertularia</i>	9.7	1.9	1168.1	0.2	chrysophyte
<i>Dinobryon sertularia</i>	5.7	1.0	678.2	0.2	chrysophyte
<i>Kephyrion</i> sp.	4.5	1.0	345.2	0.1	chrysophyte
<i>Lagnion</i> sp.	12.0	2.6	757.0	0.1	chrysophyte

Species	Density #/ml	Density, %	Biovolume, um³/mL	Biovolume, %	Group
Lagynion sp.	6.1	1.3	385.9	0.1	chrysophyte
Cryptomonas erosa	75.9	23.1	39457.0	7.4	cryptophyte
Cryptomonas erosa	69.8	18.3	36282.2	12.6	cryptophyte
Cryptomonas erosa	145.5	21.6	75649.8	17.9	cryptophyte
Rhodomonas minuta	10.4	2.3	207.9	0.0	cryptophyte
Rhodomonas minuta	28.3	7.7	565.4	0.2	cryptophyte
Rhodomonas minuta	58.3	8.3	1166.1	0.2	cryptophyte
Achnanthes clevei	4.7	1.0	698.9	0.1	diatom
Achnanthes lanceolata	3.6	1.2	648.9	0.4	diatom
Achnanthes lanceolata	13.4	1.9	2416.9	0.4	diatom
Achnanthes linearis	5.1	1.7	675.4	0.1	diatom
Achnanthes linearis	3.7	1.1	484.8	0.2	diatom
Achnanthes minutissima	17.7	6.9	884.1	0.2	diatom
Achnanthes minutissima	35.9	9.9	1794.1	0.7	diatom
Achnanthes minutissima	22.8	4.1	1139.2	0.4	diatom
Amphora perpusilla	3.9	1.0	648.2	0.1	diatom
Amphora perpusilla	3.6	1.2	598.4	0.4	diatom
Asterionella formosa	2.1	1.3	1417.4	0.5	diatom
Asterionella formosa	21.9	5.8	24567.9	8.3	diatom
Asterionella formosa	17.9	3.4	22581.4	9.3	diatom
Caloneis ventricosa minuta	3.7	1.0	1047.1	0.4	diatom
Caloneis ventricosa minuta	5.7	1.0	1582.5	0.4	diatom
Cocconeis placentula	6.6	1.7	3019.3	0.5	diatom
Cocconeis placentula	6.8	1.7	3126.1	1.5	diatom
Cyclotella meneghiniana	8.0	2.3	3466.3	1.5	diatom
Cyclotella meneghiniana	7.8	0.9	2954.8	0.3	diatom
Cyclotella stelligera	13.6	2.0	750.7	0.1	diatom
Cymbella minuta	12.5	3.5	4640.4	0.8	diatom
Cymbella minuta	8.9	2.7	3275.6	1.5	diatom
Cymbella minuta	18.9	1.0	6977.7	0.7	diatom
Cymbella sinuata	5.2	1.1	727.6	0.1	diatom
Cymbella sinuata	4.6	1.0	640.1	0.1	diatom
Diatoma tenue	5.3	1.0	1542.3	0.3	diatom
Diatoma tenue	4.0	1.2	1151.3	0.8	diatom
Fragilaria construens venter	5.3	1.0	510.6	0.1	diatom
Fragilaria crotonensis	3.7	1.0	94238.8	36.5	diatom
Fragilaria vaucheria	3.2	0.6	934.4	0.1	diatom
Fragilaria vaucheria	6.4	1.6	4410.6	2.1	diatom
Gomphonema angustatum	3.2	0.6	584.0	0.1	diatom
Gomphonema angustatum	3.7	1.0	673.1	0.3	diatom
Gomphonema angustatum	4.8	1.1	603.9	0.2	diatom
Gomphonema olivaceum	3.9	1.0	878.6	0.1	diatom
Gomphonema subclavatum	3.7	1.0	4487.6	1.7	diatom
Melosira ambigua	6.2	1.9	13089.3	2.3	diatom
Melosira ambigua	5.5	1.3	16404.2	5.0	diatom
Melosira ambigua	19.8	2.7	44324.0	10.0	diatom
Melosira granulata	8.1	3.1	16229.7	3.5	diatom

Species	Density #/ml	Density, %	Biovolume, um³/mL	Biovolume, %	Group
Melosira granulata	4.5	1.1	6751.5	1.5	diatom
Melosira granulata	22.5	2.0	62077.0	7.7	diatom
Melosira granulata angustissima	5.7	1.0	1412.9	0.3	diatom
Navicula cascadenis	3.7	1.0	224.4	0.1	diatom
Navicula cryptocephala	6.9	2.1	1282.2	0.2	diatom
Navicula cryptocephala	9.1	2.9	1692.3	0.9	diatom
Navicula cryptocephala	18.4	1.5	17854.9	10.5	diatom
Navicula cryptocephala veneta	3.9	1.0	371.0	0.1	diatom
Navicula cryptocephala veneta	4.6	1.0	434.4	0.1	diatom
Navicula decussis	7.8	0.9	1493.0	0.2	diatom
Navicula gregaria	2.1	1.3	375.8	0.1	diatom
Navicula gregaria	4.1	1.1	723.1	0.2	diatom
Navicula minima	5.7	1.0	248.7	0.1	diatom
Navicula pupula	5.7	1.0	1525.9	0.4	diatom
Navicula tripunctata	5.3	1.0	5956.6	1.0	diatom
Navicula viridula	3.7	1.0	1682.8	0.7	diatom
Nitzschia amphibia	4.7	1.0	447.3	0.1	diatom
Nitzschia amphibia	5.5	1.6	532.1	0.2	diatom
Nitzschia communis	3.7	1.0	168.3	0.1	diatom
Nitzschia dissipata	7.5	2.1	2011.9	0.8	diatom
Nitzschia dissipata	5.7	1.0	1520.3	0.4	diatom
Nitzschia fonticola	3.6	1.2	151.4	0.1	diatom
Nitzschia frustulum	2.7	0.9	323.5	0.1	diatom
Nitzschia frustulum	8.3	2.1	992.2	0.3	diatom
Nitzschia frustulum	5.7	1.0	678.2	0.2	diatom
Nitzschia innominata	3.7	1.1	176.3	0.1	diatom
Nitzschia paleacea	2.1	1.3	210.5	0.1	diatom
Nitzschia paleacea	3.6	1.2	353.3	0.2	diatom
Nitzschia paleacea	9.8	0.7	990.6	0.2	diatom
Pinnularia sp.	3.2	0.6	1297.8	0.2	diatom
Stephanodiscus hantzschii	85.1	18.7	10212.5	1.4	diatom
Stephanodiscus hantzschii	59.3	12.1	7115.3	1.1	diatom
Stephanodiscus hantzschii	5.7	1.0	678.2	0.2	diatom
Stephanodiscus niagarae	53.9	15.3	430958.4	74.6	diatom
Stephanodiscus niagarae	26.1	5.5	208964.8	34.9	diatom
Stephanodiscus niagarae	5.7	1.0	45213.0	11.2	diatom
Synedra cyclosum	10.2	4.1	8649.4	2.2	diatom
Synedra cyclosum	5.5	1.6	4683.2	2.1	diatom
Synedra cyclosum	5.8	1.0	4900.3	1.4	diatom
Synedra rumpens	4.0	1.2	555.8	0.4	diatom
Synedra ulna	5.3	1.0	21167.2	3.5	diatom
Ceratium hirundinella	3.2	0.6	31797.1	4.4	dinoflagellate
Ceratium hirundinella	3.6	1.2	35330.1	21.1	dinoflagellate
Trachelomonas volvocina	7.9	2.4	14967.2	10.1	euglenoid
Ankistrodesmus falcatus	37.1	10.2	926.8	0.2	green
Ankistrodesmus falcatus	33.8	8.2	845.2	0.2	green
Ankistrodesmus falcatus	76.2	14.8	1905.1	0.7	green

Species	Density #/ml	Density, %	Biovolume, um ³ /mL	Biovolume, %	Group
Chlamydomonas sp.	7.1	1.6	2323.5	0.3	green
Chlamydomonas sp.	17.7	0.0	5748.0	0.4	green
Gloeocystis ampla	8.8	1.9	6736.6	0.9	green
Gloeocystis ampla	7.3	1.5	6309.3	0.8	green
Pediastrum duplex	3.2	0.6	1323.8	0.2	green
Scenedesmus quadricauda	7.8	0.9	2021.7	0.2	green
Schroederia sp.	6.5	1.3	292.0	0.0	green
Schroederia sp.	4.5	1.1	1036.6	0.3	green
Schroederia sp.	7.8	0.9	349.9	0.0	green
Sphaerocystis schroeteri	3.2	0.6	908.5	0.1	green

Table 2 2014 Phytoplankton Summary

	7-Jul-14	29-Jul-14	29-Jul-14	4-Aug-14	4-Aug-14	18-Aug-14	18-Aug-14	8-Sep-14	8-Sep-14	15-Sep-14	15-Sep-14
Total Density (#/mL):	172	398	503	475	521	363	292	582	65,085	824	333
Total Biovolume (um³/mL):	273,536	741,206	720,763	764,217	601,532	257,975	167,505	405,035	1,553,959	929,013	148,854
Trophic State Index:	40.5	47.7	47.5	47.9	46.2	40.1	37.0	43.3	53.0	49.3	36.1

Table 3 Average Phytoplankton Density by Growing Season Months

	July	August	September
Total Density (#/mL):	358	413	16,706
Total Biovolume (um³/mL):	578,501	447,807	759,215
Trophic State Index:	45	43	45

Table 4 Major Species Found in 2014 Growing Season

Major Species	
Anabaena flos-aquae	bluegreen
Aphanizomenon flos-aquae	
Microcystis aeruginosa	
Cryptomonas erosa	cryptophyte
Rhodomonas minuta	
Fragilaria crotonensis	diatom
Melosira ambigua	
Navicula cryptocephala	
Stephanodiscus niagarae	
Ceratium hirundinella	dinoflagellate
Ankistrodesmus falcatus	Green
Peak	
Anabaena flos-aquae	787,726
Stephanodiscus niagarae	593,524

Table 5 Species Diversity and Average Biovolume by Functional Group

Functional Group	Species	Ave Density #/ml	Average Biovolume, um3/mL
bluegreen	3	4661	155,795
chrysophyte	4	7	617
cryptophyte	2	65	25,555
diatom	44	10	14,171
dinoflagellate	1	3	33,564
green	7	17	2,364
euglenoid	1	8	14,967

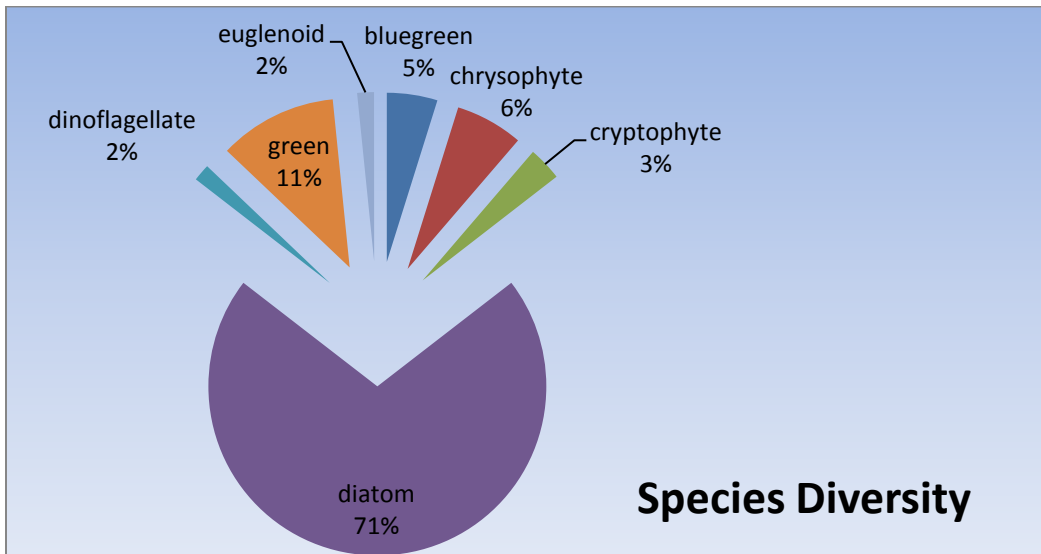


Figure 2 2014 Species Diversity by Functional Group

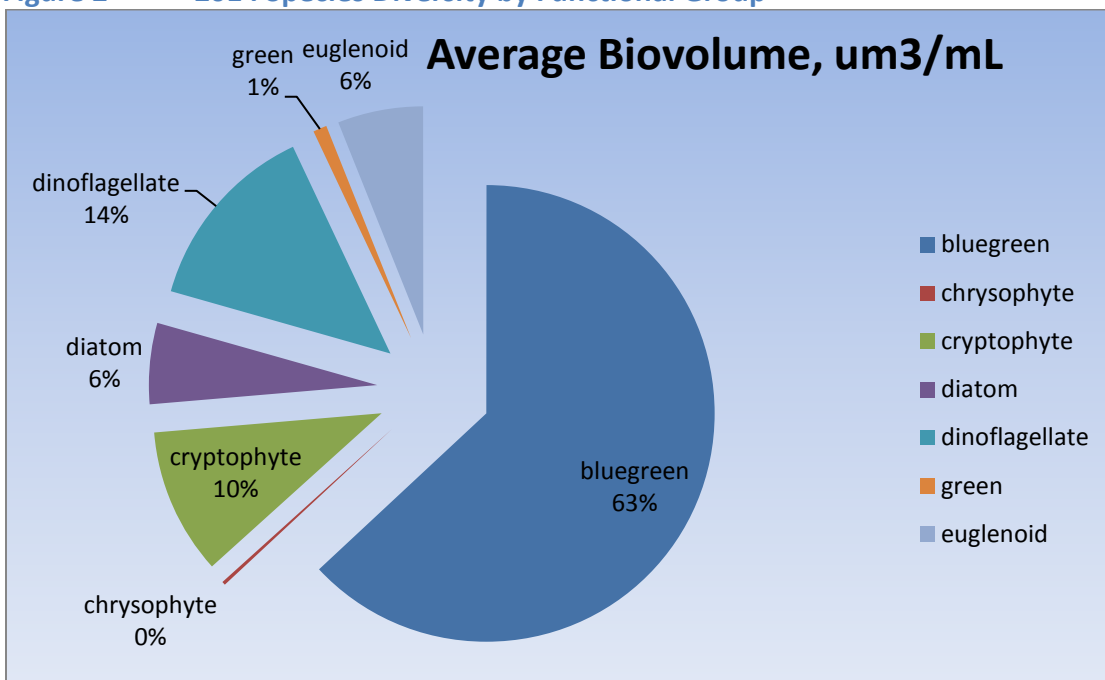


Figure 3 Average Biovolume by Functional Group

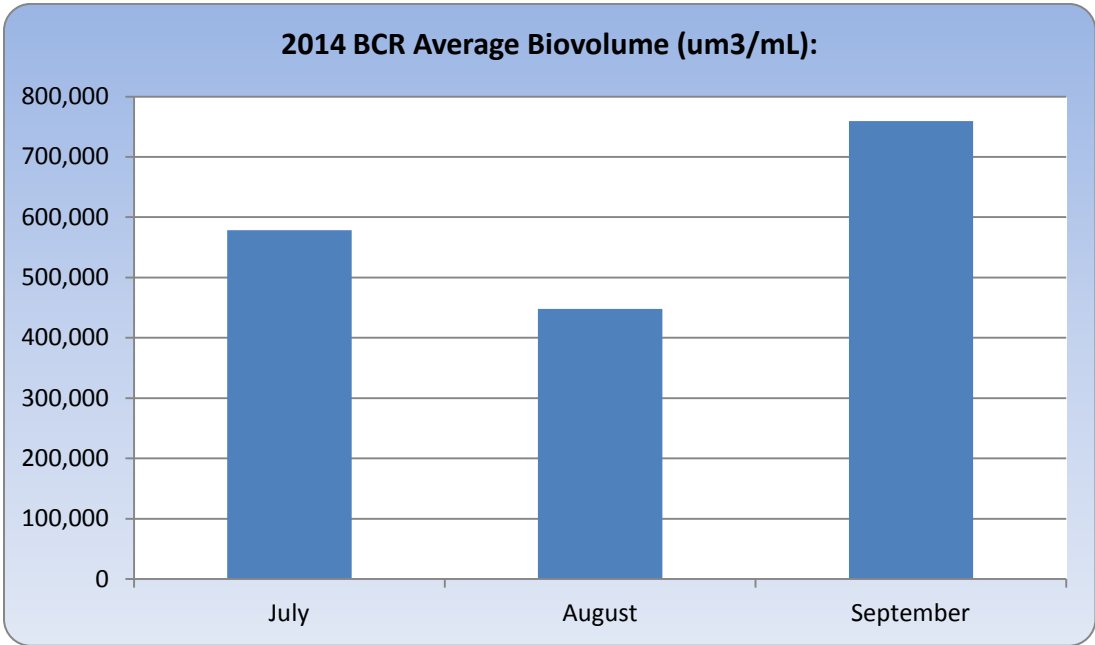


Figure 4 2014 BCR Average Biovolume by Month



Figure 5 Aphanizomenon flos-aquae and Anabaena flos-aquae Bloom