

Technical Memorandum BCWA



Date: January 27, 2016
To: Bear Creek Watershed Association
From: Russell N. Clayshulte, Manager
Re: BCWA TM 2015.10 BCR Phytoplankton Summary

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Phytoplankton samples are taken at the Site 40 buoy in BCR for the July, August and September sample periods. The samples are 1-liter composites taken at -1 meter. Two samples are taken for the laboratory. This results in 12 sample sets. The replicate data from the same date is averaged, and then a monthly average is calculated that includes all counted species. There can be considerable variation among duplicate samples and for any given month. As such, 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 Average Phytoplankton for 2015 Monitoring Season

Species	Density #/ml	Density, %	Biovolume, um ³ /mL	Biovolume, %	Group
Anabaena flos-aquae	12	0.9	11,712	1.7	bluegreen
Anabaena planctonica	15	0.8	81,447	3.5	bluegreen
Anabaena planctonica	194	3.5	1,001,001	28.8	bluegreen
Aphanizomenon flos-aquae	36	0.8	95,402	4.1	bluegreen
Aphanizomenon flos-aquae	89	0.7	123,468	2.4	bluegreen
Chromulina sp.	36	1.4	722	0.1	chrysophyte
Chrysococcus rufescens	46	1.5	3,904	0.2	chrysophyte
Dinobryon bavaricum	7	0.6	859	0.3	chrysophyte
Dinobryon sertularia	38	1.2	4,586	0.2	chrysophyte
Dinobryon sp.	104	5.3	13,047	3.0	chrysophyte
Kephyrion littorale	19	0.6	1,815	0.1	chrysophyte
Kephyrion littorale	28	0.1	2,705	0.0	chrysophyte
Kephyrion sp.	17	1.0	1,074	0.2	chrysophyte
Kephyrion sp.	47	1.5	2,971	0.2	chrysophyte
Kephyrion sp.	36	2.9	2,282	0.4	chrysophyte
Kephyrion spirale	20	0.4	1,246	0.0	chrysophyte
Lagynion sp.	19	0.6	1,204	0.1	chrysophyte
Lagynion sp.	72	5.8	4,563	0.7	chrysophyte
Mallomonas sp.	18	0.7	6,855	1.3	chrysophyte
Chrysococcus rufescens	22	1.3	1,870	0.2	cryptophyte
Cryptomonas erosa	586	29.8	304,529	44.9	cryptophyte
Cryptomonas erosa	1,740	36.6	904,603	33.5	cryptophyte
Cryptomonas erosa	3523	40.1	1,831,835	52.8	cryptophyte
Rhodomonas minuta	711	33.7	14,230	2.5	cryptophyte
Rhodomonas minuta	1,822	26.5	36,447	1.0	cryptophyte
Rhodomonas minuta	7837	34.7	156,731	2.6	cryptophyte
Achnanthes lanceolata	7	0.6	1,289	0.4	diatom
Achnanthes lanceolata	14	0.5	2,506	0.2	diatom
Achnanthes lanceolata	19	0.4	3,337	0.2	diatom
Achnanthes linearis	7	0.6	945	0.3	diatom
Achnanthes linearis	28	1.1	3,675	0.3	diatom
Achnanthes minutissima	7	0.6	358	0.1	diatom
Achnanthes minutissima	17	0.5	843	0.0	diatom
Achnanthes minutissima	82	3.8	4,233	0.4	diatom
Amphora perpusilla	16	1.3	2,649	0.4	diatom
Asterionella formosa	33	1.8	49,745	2.3	diatom
Asterionella formosa	651	22.5	309,929	19.5	diatom
Asterionella formosa	30	1.7	38,323	3.6	diatom
Cocconeis placentula	15	0.8	6,824	0.3	diatom
Cocconeis placentula	19	0.6	8,791	0.5	diatom
Cocconeis placentula	17	1.6	7,918	1.3	diatom
Cyclotella stelligera	15	0.8	816	0.0	diatom
Cyclotella stelligera	37	0.7	2,021	0.1	diatom
Cyclotella stelligera	27	1.2	1,476	0.1	diatom
Cymbella minuta	22	0.3	8,234	0.2	diatom
Cymbella minuta	19	0.8	7,072	0.6	diatom
Cymbella sinuata	7	0.6	1,002	0.3	diatom
Diatoma tenue	17	1.6	4,992	0.8	diatom
Gomphonema angustatum	7	0.6	1,289	0.4	diatom
Gomphonema angustatum	17	1.6	3,098	0.5	diatom
Melosira ambigua	26	0.6	105,326	3.5	diatom
Melosira ambigua	12	0.9	61,777	9.1	diatom
Melosira granulata	667	31.4	1,263,861	55.6	diatom
Melosira granulata	71	1.4	144,602	4.7	diatom
Melosira granulata angustissima	44	0.9	54,093	2.1	diatom
Melosira granulata angustissima	28	0.1	21,354	0.3	diatom
Navicula capitata	19	0.5	9,334	0.4	diatom
Navicula cryptocephala	20	0.4	3,659	0.1	diatom
Navicula cryptocephala	16	0.6	3,005	0.2	diatom

Species	Density #/ml	Density %	Biovolume, um ³ /mL	Biovolume, %	Group
Navicula cryptocephala veneta	25	0.3	2,349	0.1	diatom
Navicula cryptocephala veneta	26	2.4	2,453	0.4	diatom
Navicula graciloides	9	0.8	3,744	0.6	diatom
Navicula gregaria	23	1.7	4,079	0.6	diatom
Navicula minima	15	0.8	653	0.0	diatom
Navicula pupula	20	0.4	5,341	0.1	diatom
Navicula sp.	12	0.9	1,748	0.3	diatom
Nitzschia capitellata	20	0.4	7,121	0.2	diatom
Nitzschia frustulum	19	0.4	2,225	0.1	diatom
Nitzschia palea	7	0.6	1,289	0.4	diatom
Nitzschia palea	20	0.4	3,561	0.1	diatom
Nitzschia palea	40	0.2	7,197	0.1	diatom
Nitzschia paleacea	7	0.6	702	0.2	diatom
Rhoicosphenia curvata	12	0.9	1,363	0.2	diatom
Stephanodiscus astraea minutula	7	0.6	2,506	0.8	diatom
Stephanodiscus hantzschii	7	0.6	859	0.3	diatom
Stephanodiscus hantzschii	20	0.4	2,374	0.1	diatom
Stephanodiscus hantzschii	28	0.9	3,361	0.2	diatom
Stephanodiscus niagarae	28	0.1	227,778	3.4	diatom
Synedra ulna	15	0.8	29,523	1.3	diatom
Ceratium hirundinella	19	0.6	187,280	10.0	dinoflagellate
Glenodinium sp.	34	0.6	23,997	0.8	dinoflagellate
Glenodinium sp.	54	0.3	37,953	0.7	dinoflagellate
Euglena sp.	40	0.2	23,190	0.4	euglenoid
Trachelomonas charkowensis	57	0.2	113,889	1.7	euglenoid
Trachelomonas crebea	18	0.7	27,060	5.0	euglenoid
Trachelomonas crebea	40	0.2	59,973	1.1	euglenoid
Trachelomonas hispida	22	0.3	46,732	1.2	euglenoid
Trachelomonas hispida	34	0.9	72,160	4.1	euglenoid
Trachelomonas robusta	35	0.4	73,874	2.1	euglenoid
Trachelomonas scabra	36	1.4	57,728	10.8	euglenoid
Trachelomonas scabra	14	0.5	22,272	1.6	euglenoid
Trachelomonas scabra	67	0.8	107,262	3.3	euglenoid
Trachelomonas volvocina	99	1.1	186,433	4.8	euglenoid
Trachelomonas volvocina	413	4.6	777,586	21.5	euglenoid
Ankistrodesmus falcatus	50	2.5	1,360	0.2	green
Ankistrodesmus falcatus	80	2.4	2,429	0.1	green
Ankistrodesmus falcatus	28	0.1	712	0.0	green
Chlamydomonas sp.	45	2.1	14,622	1.4	green
Chlamydomonas sp.	20	0.4	6,429	0.2	green
Chlamydomonas sp.	12	0.9	3,787	0.6	green
Chodatella wratislawiensis	15	0.8	890	0.0	green
Crucigenia quadrata	9	0.8	2,926	0.5	green
Oocystis pusilla	20	0.5	8,667	0.5	green
Scenedesmus denticulatus	12	0.9	2,098	0.3	green
Scenedesmus quadricauda	16	1.3	3,391	0.5	green
Sphaerocystis schroeteri	12	0.9	3,263	0.5	green

Table 2 Phytoplankton Summary by Sample Set

Sample Date:	6-Jul-15	6-Jul-15	20-Jul-15	20-Jul-15	11-Aug-15	11-Aug-15
Total Density (#/mL):	2,652	1,253	1,914	2,374	2,631	3,249
Total Biovolume (um³/mL):	536,374	312,593	2,340,660	2,296,005	1,358,206	1,875,147
Trophic State Index:	45.4	41.5	56.0	55.8	52.1	54.4
Sample Date:	25-Aug-15	25-Aug-15	14-Sep-15	14-Sep-15	28-Sep-16	28-Sep-15
Total Density (#/mL):	5,024	8,605	1,084	1,363	16,073	31,063
Total Biovolume (um³/mL):	3,872,409	3,858,893	607,731	677,316	5,434,990	6,655,410
Trophic State Index:	59.6	59.6	46.3	47.0	62.1	63.5

Table 3 Species Diversity, Density and Biovolume by Functional Group

Functional Group	Species	Ave Density #/ml	Average Biovolume, um ³ /mL
bluegreen	3	69	262,606
chrysophyte	10	36	3,417
cryptophyte	2	2320	464,321
diatom	31	45	46,200
dinoflagellate	2	36	83,076
green	7	26	4,215
euglenoid	8	73	130,680

Table 4 Monthly Phytoplankton Density, Biovolume and Trophic State Index

	July	August	September
Total Density (#/mL):	2,048	2,940	12,396
Total Biovolume (um³/mL)	1,371,408	1,616,677	3,343,862
Trophic State Index:	50	53	55

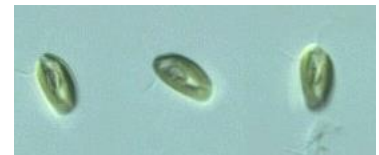


Figure 2 Cryptomonas erosa

Table 5 Major Phytoplankton Species in 2015

Major Species	Peak Biovolume, um ³ /mL	Group
Anabaena planctonica	2,019,887	bluegreen
Cryptomonas erosa	3,745,806	cryptophyte
Trachelomonas volvocina	1,808,798	euglenoid

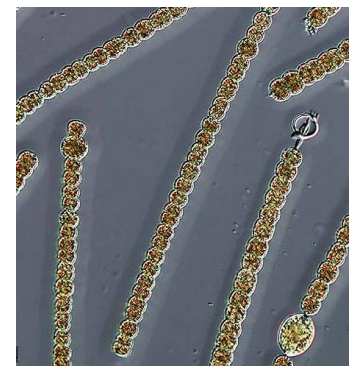


Figure 3 Anabaena planctonica

Anabaena planctonica	Bluegreen
Aphanizomenon flos-aquae	
Kephyrion sp.	chrysophyte
Cryptomonas erosa	cryptophyte
Rhodomonas minuta	
Asterionella formosa	diatom
Melosira ambigua	
Melosira granulata	
Melosira granulata angustissima	
Stephanodiscus niagarae	
Trachelomonas charkowensis	euglenoid
Trachelomonas hispida	
Trachelomonas robusta	
Trachelomonas scabra	
Trachelomonas volvocina	
Chlamydomonas sp.	Green
Oocystis pusilla	

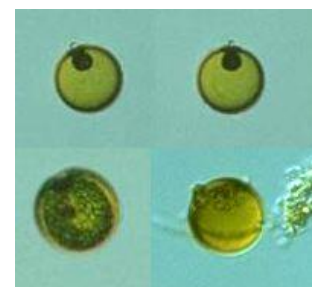


Figure 4 Trachelomonas volvocina

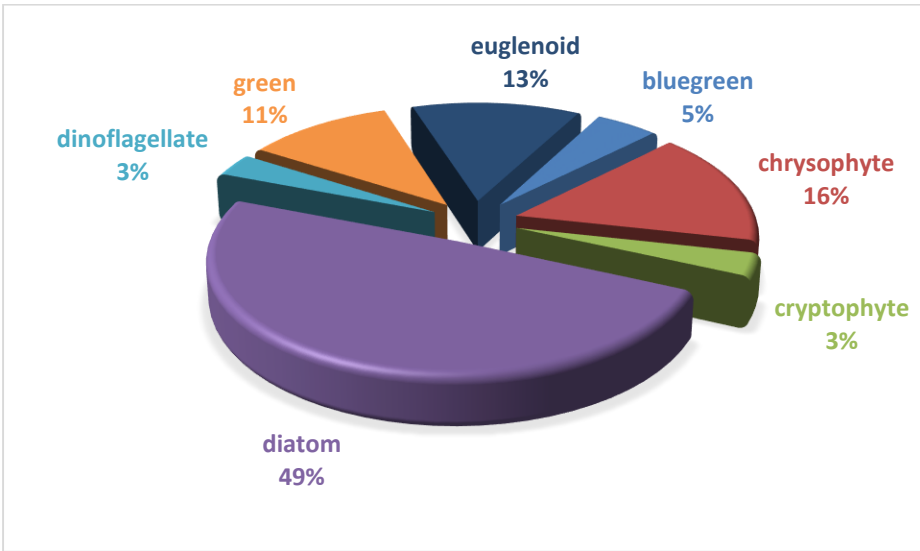


Figure 5 Species Diversity

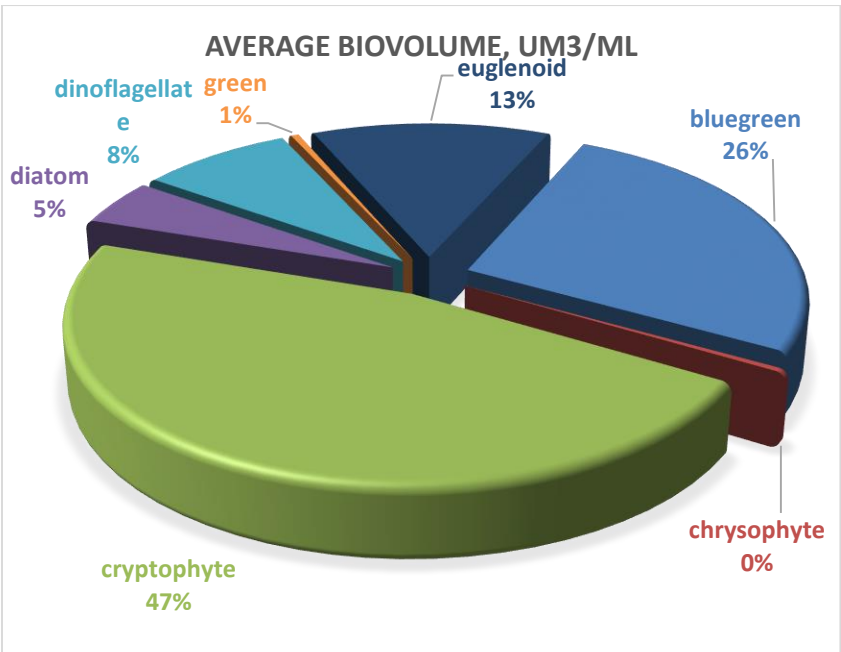


Figure 6 Average Biovolume

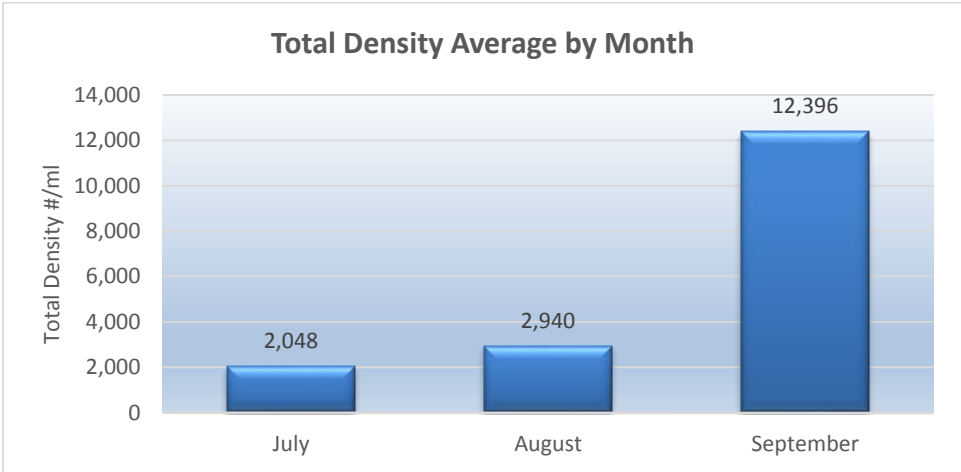


Figure 7 Average Density of Phytoplankton per Month