

Bear Creek Watershed Association

DATE: August 9, 2009

RE: July 2009 Watershed Monthly Sampling and Monitoring Summary



This memo summarizes the July 2009 watershed sampling and monitoring event performed on Bear Creek mainstem from Summit Lake in the Mt. Evans Wilderness to Morrison, and the North and South Turkey Creek drainages. Sampling and monitoring performed on July 7 (Summit Lake and upper Bear Creek Segment 7) and July 9 (all other Sites). Evergreen Lake is now a standalone stream segment, 1d), as such the monitoring program required an adjustment. Data collection is specific for a lake/reservoir characterization. This includes a vertical profile data at 1-meter increments and nutrient measurements in the surface and bottom layers.

The data consists of 4 Tables and 4 charts (Figures). Table 1 summarizes monitoring and sampling results with statistical analyses. Table 2 lists Site ID and locations. Table 3 summarizes measured flows. Table 4 summaries sampling and monitoring at the Evergreen Lake profile station. Figure 1 graphs monitoring results at all Sites for the four parameters (pH, Temperature, Dissolved Oxygen and Specific Conductance). Figure 2 graphs sampling results for water quality parameters (Ammonia as N, Nitrate+Nitrite as N, (Total Inorganic Nitrogen—TIN as N), and Total Phosphorous). Figure 3 graphs temperature and Dissolved Oxygen at the Evergreen Lake profile station. Figure 4 graphs the nutrient and TSS results for the Evergreen Lake profile station.

On the Monitoring chart (Figure 1), Specific Conductance is reported on the secondary X-axis. On the Sampling chart (Figure 2), Nitrate+Nitrite and TIN results were plotted against the primary X-axis, and Total Phosphorous and Total Ammonia are reported on the secondary X-axis. All monitoring points were reported, including the sub-surface Lake profile stations.

For the July 2009 sampling and monitoring event, there were several measurements of note. Elevated Specific Conductance values were recorded at Turkey Creek Sites 18 and 19 (typical) and the highest instantaneous temperature recorded (17.67°C) was at Site 19. There was one exceedance of the stream standard for Dissolved Oxygen at Site 18 (5.46 mg/L) and one exceedance of pH at Site 37 (below Summit Lake-6.28). However, this portion of upper Bear Creek flows through a wetland complex, which can reduce pH. Although there were no extraordinary measurements of nutrients recorded, it should be noted that the Total Ammonia and NO₃+NO₂ results from Sites 36 and 37 (Summit Lake and below Summit Lake) were surprisingly high. Results from the Nitrate/Nitrite analyses show no exceedances of the 10 mg/L Nitrate stream standard.

Evergreen Lake monitoring resulted in four of five measurements of Dissolved Oxygen below 6.0 mg/L at the profile station. The average DO for the Profile Station (0-3m) was 5.75 mg/L, which is low. The 1-3m temperature average (WAT) was 14.63 °C. Results from Evergreen Lake sampling (1-meter from the surface and 1-meter from the bottom) showed elevated Ammonia values in the lower sample site.

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Data Manager

Table 1 Bear Creek Monthly Sampling and Monitoring Summary-July 2009

Bear Creek Monthly Sampling and Monitoring Summary-July 9, 2009 (Sites 36 and 37 sampled/monitored July 7, 2009) Bear Creek from Mt. Evans Wilderness drainage to the west end of Morrison (Morrison Park), and Turkey Creek drainages.

Site #	pH SU	Temp °C	DO mg/L	Sp Cond uS/cm	NH3- N ug/L	NO3+NO2- N ug/L	TIN ug/L	Total P ug/L	TSS mg/L
Segment 1a – Bear Creek Drainage above Evergreen Lake									
Site 1a	7.42	9.27	7.41	0.037	13	82	95	12	
Site 3a	8.15	12.01	7.28	0.055	11	11	22	15	
Segment 3 – Tributary of Upper Bear Creek (Vance Creek)									
Site 25	7.92	9.88	7.14	0.061	11	16	27	53	
Segment 1d - Evergreen Lake (EGL)									
Site 4a	7.66		5.81	0.063					
Site 4b	7.66	16.49	5.89	0.063	34	17	51	34	5.2
Site 4c	7.65	14.47	6.1	0.064					
Site 4d	7.6	12.94	4.78	0.067	142	27	169	28	5.0
Site 4e	7.62	11.79	1.96	0.077					
Segment 1e – Mainstem Bear Creek from EGL to Harriman Ditch									
Site 5	8.14	15.93	6.28	0.088	18	23	41	12	
Site 7	8.33	16.31	6.08	0.092	17	31	48	25	
Site 8a	8.35	16.7	6.36	0.1	24	105	129	24	
Site 9	8.41	16.87	6.32	0.143	18	182	200	26	
Site 12	8.52	16.71	6.41	0.163	25	181	206	34	
Site 13a	8.47	17.02	6.29	0.164	46	167	213	42	
Site 14a	8.53	16.79	6.42	0.162	18	156	174	33	
Segment 6a Mainstem Turkey Creek and South Turkey Creek									
Site 18	8.27	16.04	5.46	0.679	24	13	37	14	
Segment 6b – North Turkey Creek									
Site 19	8.97	17.67	6.17	0.341	14	45	59	34	
Segment 7 – Bear Creek downstream of Summit Lake									
Site 37	6.28	6.37	7.5	0.018	27	110	137	6	
Segment 8 – Summit Lake									
Site 36	6.99	5.3	6.91	0.02	24	109	133	7	
MIN	6.28	5.30	1.96	0.018	11	11	22	6	
MAX	8.97	17.67	7.50	0.679	142	182	213	53	
AVG	7.94	13.81	6.14	0.129	29	80	109	25	
StDev	0.61	3.77	1.18	0.148	30	63	67	13	
Stream Std. Exceedance	1	None	2			0			
Stream Std.	6.5 – 9 SU	See note	6.0 mg/L			(NO3-N) 10,000 ug/L			

Temperature Standards:

Segment 1a, Segment 3, Segment 7 T=TVS °C (CS-I), June-Sept 17.0 MWAT/21.2 DM

Segment 8 T=TVS °C (CLL), Apr-Dec 17.0 MWAT/21.2 DM

Segment 1d T=TVS °C (CLL), Apr-Dec 18.2 MWAT/23.8 DM

Segment 1e T=TVS °C (CS-II), Apr-Oct 18.2 MWAT/23.8 DM

Segment 6a T=TVS °C (CS-II), Apr-Oct 18.2 MWAT/23.8 DM

Segment 6b T=TVS °C (CS-I), June-Sept 17.0 MWAT/21.2 DM

Table 2 Site Locations

Site #	Site Location
Site 1a	Lost & Found (Singin' River Ranch)
Site 25	Vance Creek (Mt. Evans Wilderness Tributary)
Site 3a	Above Evergreen Lake at CDOW Site
Site 4	Evergreen Lake Surface, Profile Station
Site 4a	Surface
Site 4b	-1- meter
Site 4c	-2- meters
Site 4d	-3-meters
Site 4e	-4- meters
Site 5	Above EMD WWTP, at CDOW downtown site
Site 7	Below EMD WWTP effluent
Site 8a	Bear Creek Cabins at CDOW Site
Site 9	O'Fallon Park, west end at CDOW Site
Site 12	Lair o' the Bear Park, at CDOW site
Site 13a	Below Idledale, Shady Lane at CDOW site
Site 14a	Morrison Park west end of town, at CDOW Site
Site 18	South Turkey Creek Aspen Park Metropolitan District
Site 19	North Turkey Creek Conifer Metropolitan District
Site 36	Summit Lake
Site 37	Below Summit Lake outfall, at 1 st ripple of Bear Creek

Table 3 2009 Bear Creek Special Study - Flow (cfs)

	May-09	Jun-09	Jul-09
Bear Creek			
Site 25 - Vance	13.9	26.8	8.3
Site 1a - Lost & Found	43.5	53.3	38.3
USGS Gage EGL	54	71	38
Site 3a - Keys on the Green	48	75	38
Site 5 - Little Bear			56.7
Site 7 - Below EMD WWTP		110.5	52.3
Site 8a - Bear Creek Cabins			51.8
Site 9 - O'Fallon Park	94.4		45.7
Site 12 - Lair O' The Bear	112.7		52.5
Site 13a - Idledale	126.2	97.3	56.3
Site 14a - Morrison Park West			60.9
USGS Gage BCP	72	113	29
Turkey Creek			
Site 19 - North Turkey Creek	30.7	15.4	2.2
Site 18 - South Turkey Creek	1.5	2.9	0.8

Table 4 Evergreen Lake Data Profiles

SITE: BCWA Site 4 - Dam Profile						DATE:7-9-09	
DEPTH	TIME	pH	DO	TEMP	Sp Cond	Secchi (m)	T Depth (m)
0m(-6")	7:41	7.66	5.81		0.063	1.6	4.75
1m	7:42	7.66	5.89	16.49	0.063		
2m	7:42	7.65	6.1	14.47	0.064		
3m	7:43	7.6	5.19	12.94	0.067		
4m	7:44	7.38	2.8	11.91	0.074		
1-3 m WAT				14.63			
DO 0-3m			5.75				
SITE: Site 4 (Supplemental) Middle of Lake (No separate BCWA site number assigned)							

DEPTH	TIME	pH	DO	TEMP	Sp Cond	Secchi (m)	T Depth (m)
0m(-6")	8:13	8.16	5.74		0.063	1.7	4.75
1m	8:14	8.21	5.93	16.66	0.065		
2m	8:15	8.15	5.9	14.24	0.065		
3m	8:16	7.95	4.78	13.02	0.067		
4m	8:18	7.62	1.96	11.79	0.077		
1-3 m WAT				14.64			
DO 0-3m			5.59				

Figure 1 Monitoring Summary

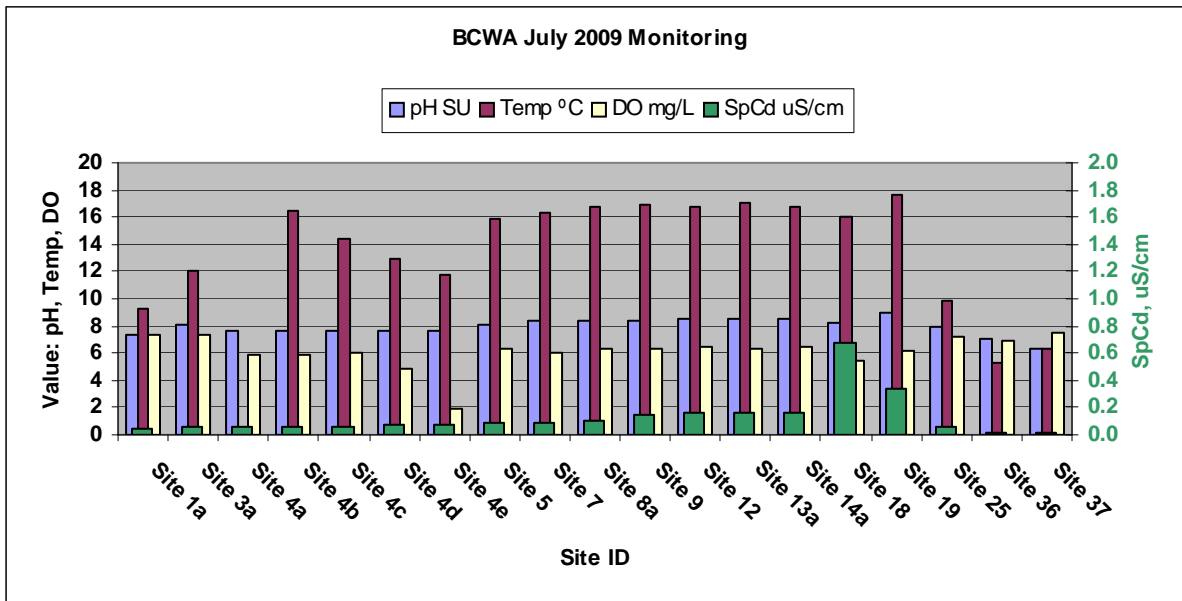


Figure 2 Sampling Results Summary

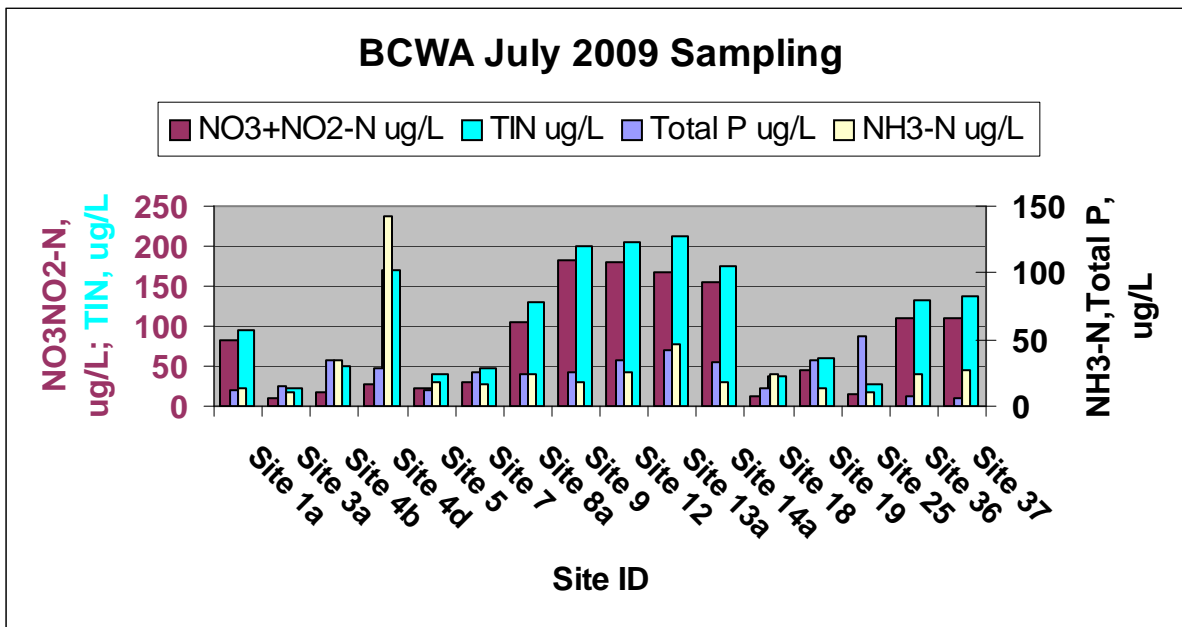


Figure 3 Evergreen Lake Profile Station Monitoring Summary

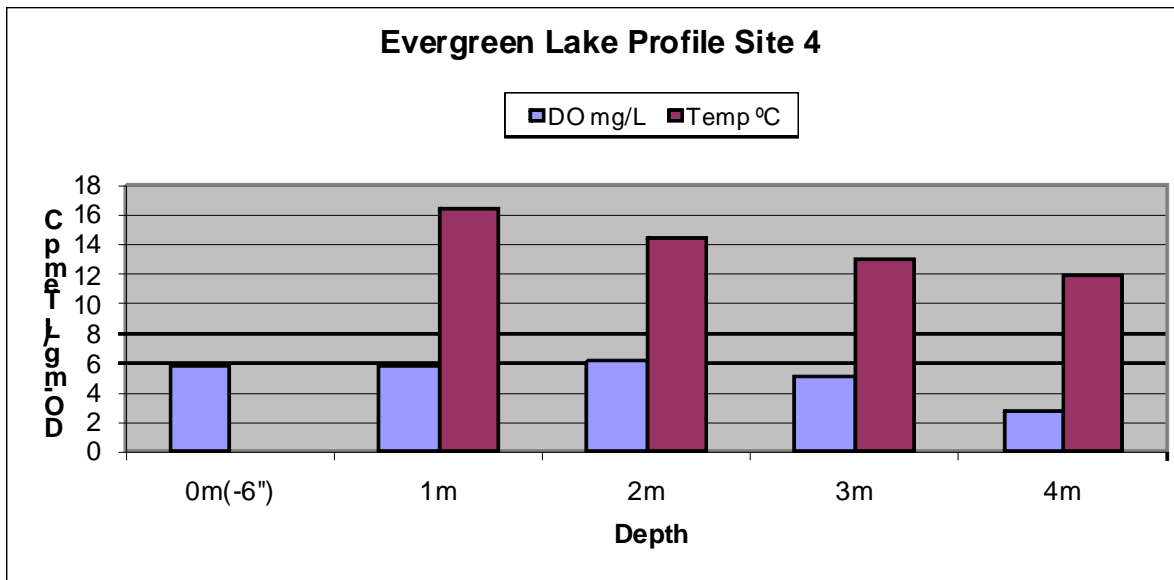


Figure 4 Evergreen Lake Profile Station Sampling Summary

