

# Technical Memorandum BCWA

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**Date:** October 6, 2015  
**To:** Bear Creek Watershed Association  
**From:** Russell N. Clayshulte, Manager  
**Re:** BCWA TM 2015.1 Sediment Survey BCR & EGL

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### Water Column Probe and Field Data

A complete water column probe set taken at each site (Dissolved Oxygen, Specific Conductance, Temperature, and pH). The total depth and Secchi reading were obtained for each site.

### Sediment Analyses Methods and Results

One sediment samples was taken at six sites in BCR (Figure 1). Mud bagged into two one-quart baggies. Bottom samples obtained with a Petite Ponar sampler. This sampler takes a grab of the top 5-10 cm of the mud bottom. One dredge drop results in about 1.5 liters of bottom mud. Excess water is decanted from sample prior to bagging (2 bags per site). GPS coordinates verified at each site. The locations in Figure are at sample sites. The samples are processed as wet mud.

One dredge sample taken in Evergreen Lake at the dam (Figure 2). The same sample procedure as done for BCR.



Figure 1 BCR Sample Site

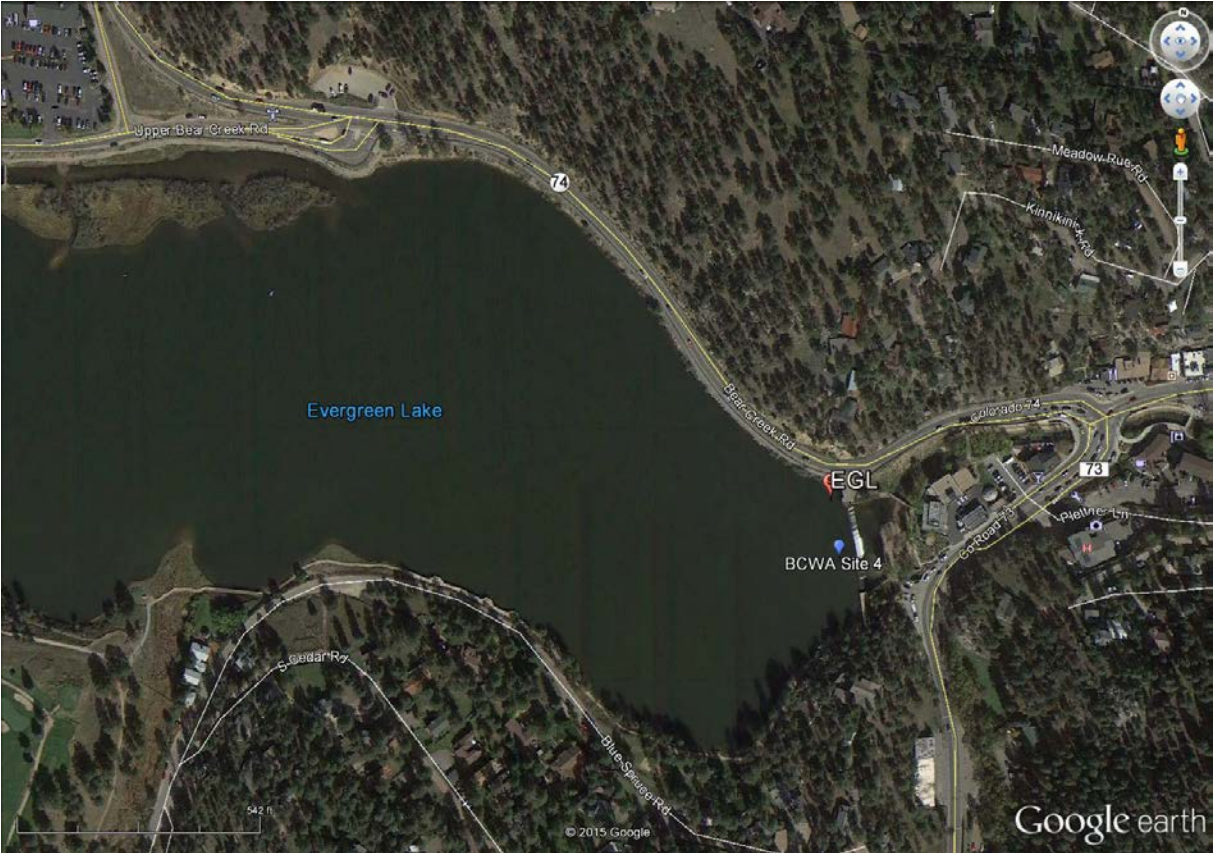


Figure 2 2015 Sediment Site EGL

**Table 1      Samples Collected**

BCWA Dredge Sample Program 10/5/2015				
Site	Sediment	Profile	Lat	Long
BC03	X	X	39.651482	-105.145700
BC05a	X	X	39.653061	-105.141098
PEL08a	X	X	39.650141	-105.144222
PEL10a	X	X	39.651351	-105.140487
TC14a	X	X	39.648723	-105.144287
TC16a	X	X	39.650405	-105.139538
EGL	X		39.631786	-105.323118
sediments taken with Petite Ponar dredge, top 5-10 cm mud				

**Total Organic Matter**

About 5 grams of wet mud sample is weighed, dried for 1 hour at 103-105 degrees C, reweighed. This value is the total solids content of the sample. The dried sample is then ashed in a muffle furnace at 550 degrees C for 15 minutes and reweighed. This procedure provides a total solids percentage and a total organic carbon or Volatile solid percentage. The total organic matter or total organic carbon (TOC) is volatilized and the percent difference is calculated to determine the estimated percentage of TOC contained in surface bottom muds (Table 2 and Figure 3). Table 3 compares the percentage TOC from 2010-2015. There was no sampling done in 2013 due to flooding and high reservoir volumes.

**Table 2      2015 TOC Results**

	% Solids	TOC %
SedBC03	26%	9.5%
SedBC05	22%	12.2%
SedPel08	17%	12.2%
SedPel10	21%	10.1%
SedTC14	74%	1.8%
SedTC16	33%	9.2%
EGL	25%	16.0%

**Table 3      2010-2015 TOC Comparison**

	% Total Organic Carbon				
	2010	2011	2012	2014	2015
SedBC03	11%	11%	9%	10.1%	9.5%
SedBC05	10%	4%	11%	9.5%	12.2%
SedPel08	11%	12%	13%	10.3%	12.2%
SedPel10	13%	10%	11%	11.2%	10.1%
SedTC14	12%	11%	10%	9.9%	1.8%
SedTC16	10%	11%	13%	10.3%	9.2%
EGL					16.0%

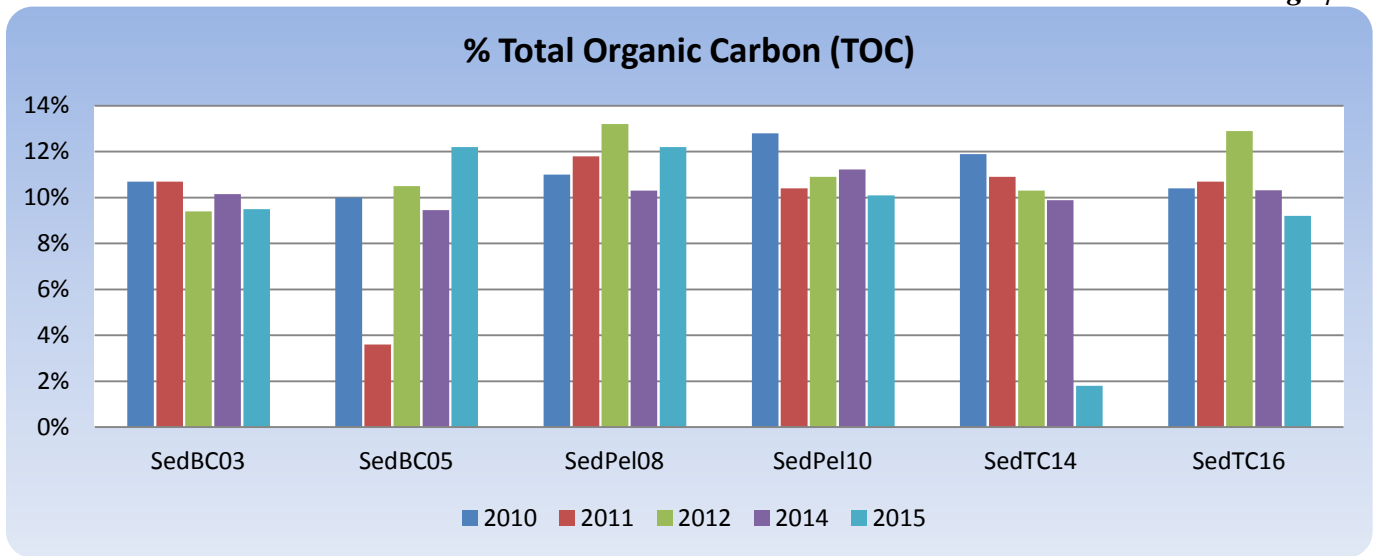


Figure 3 2015 TOC Percentage

**Grain Size Distribution**

A mechanical sieve “sandshaker” is used to determine the percentage distribution of selected grain sizes in the bottom sediments. A wet sieve method is used to separate bottom sediments into sieve pan set to obtain an estimated percentage accumulation on each pan. All bottom sediment material is less than U.S. Standard sieve 10 (0.08 inches) in diameter. As such, all reservoir sediment ranges from coarse sand to clay size. The Sieve distribution used is shown in Table 4. The grain size distribution percentages are shown in Table 5 and Figure 4.

The bottom muds are primarily a silty-clay. There were more fine sands within the Turkey Creek drainage. The dredging did encounter some medium sized gravel at BC05 near the outlet.

Table 4 Grain-size distributions used to analyze Bear Creek bottom muds.

Grain-Size Term	ASTM No.	Mesh Opening (in)	Sieve
Very Coarse & Coarse Sand	25	0.026	26 OPN
Medium Sand	60	0.009	9 OPN
Fine Sand	120	0.0046	46 OPN
Very Fine Sand	200	0.0029	29 OPN
Silt and Clay	<200		

Table 5 Grain Size Distribution

Site	Grain Size % retained				
	Coarse Sand	M Sand	F Sand	VF Sand	Silt & Clay
BC03	3%	8%	12%	14%	71%
BC05	1%	2%	4%	9%	78%
PEL08	1%	6%	10%	18%	69%
PEL10	0%	2%	6%	15%	76%
TC14	21%	32%	7%	10%	23%
TC16	1%	12%	14%	22%	70%
EGL	1%	2%	8%	10%	87%



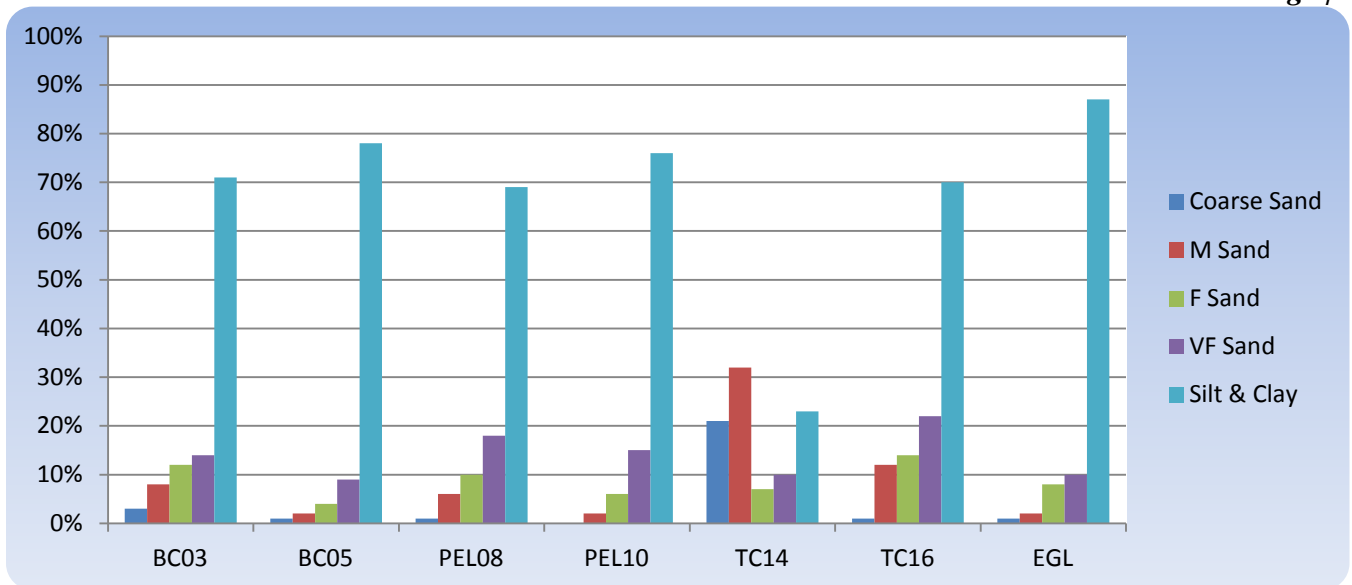


Figure 4 Grain Size Distributions

**Total Phosphorus Analysis Method**

**Extraction Procedure - Distilled Water**

Weigh 4 g of wet mud into 125 ml bottle with lid.  
 Add 20 mL of distilled water and shake manually over a one hour period.  
 Centrifuge at 3,500 rpm for 15 minutes.  
 Filter the solution through a 0.47 µm membrane filter.  
 Use 5 ml for analysis; retain remainder for dilution, if appropriate.

**Total Phosphorus in Wet Mud Test**

Determine total phosphorus as water extractable P in wet mud using HACH method 8190 PhosVer 3 with acid persulfate digestion Test “N Tube method measured with a Hach DR2010 spectrophotometer at 890 nm (Table 6 and 5). There is more phosphorus in the silty-clay muds along the Bear Creek transect.

Table 6 Total Phosphorus Data mgP/kg Mud

		mgP/kg Mud
Bear Creek Transect	SedBC03	8.73
	SedBC05	8.43
Pelican Point Transect	SedPel08	1.89
	SedPel10	1.42
Turkey Creek Transect	SedTC14	0.88
	SedTC16	7.25
Evergreen Lake @ Dam	EGL	0.54

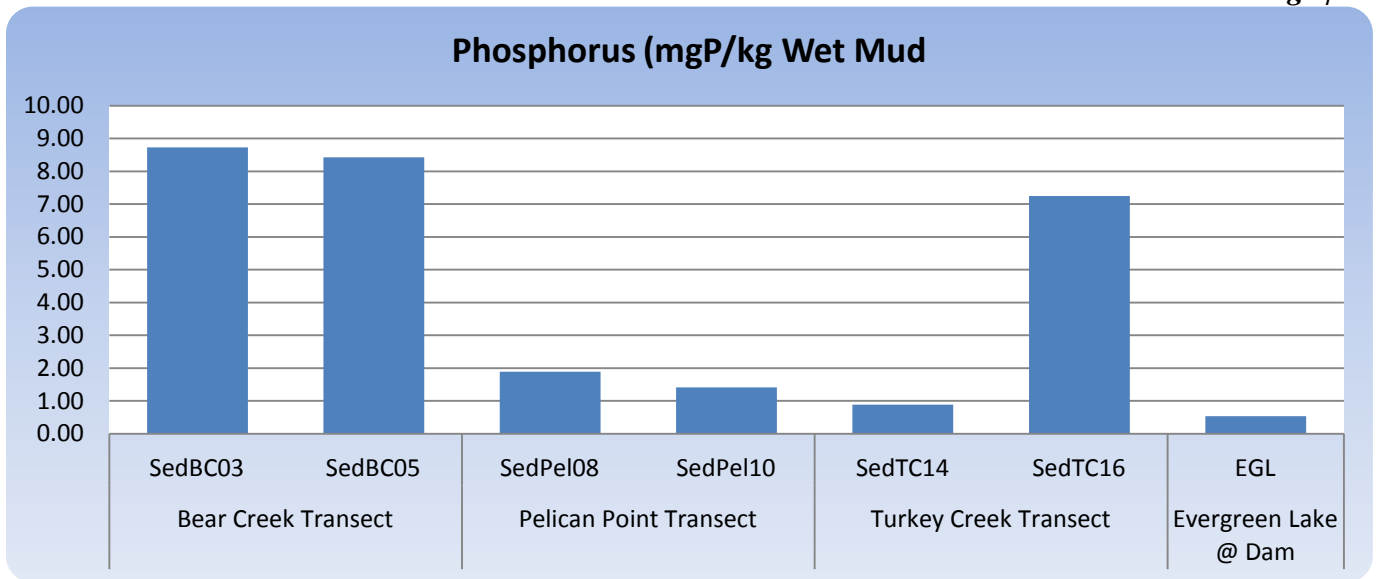


Figure 5 Phosphorus Distribution Along Transects BCR

Table 7 Comparison Phosphorus Content of Bottom Muds from 2010-2015

	Sediment Phosphorus (mgP/kg Wet Mud)				
	2010	2011	2012	2014	2015
SedBC03	4.12	6.11	3.06	4.48	8.73
SedBC05	3.50	5.21	4.38	3.06	8.43
SedPel08	7.47	3.39	4.89	8.07	1.89
SedPel10	3.13	2.20	3.19	5.69	1.42
SedTC14	7.32	8.11	3.88	3.79	0.88
SedTC16	5.76	1.91	3.90	4.85	7.25
EGL					0.54

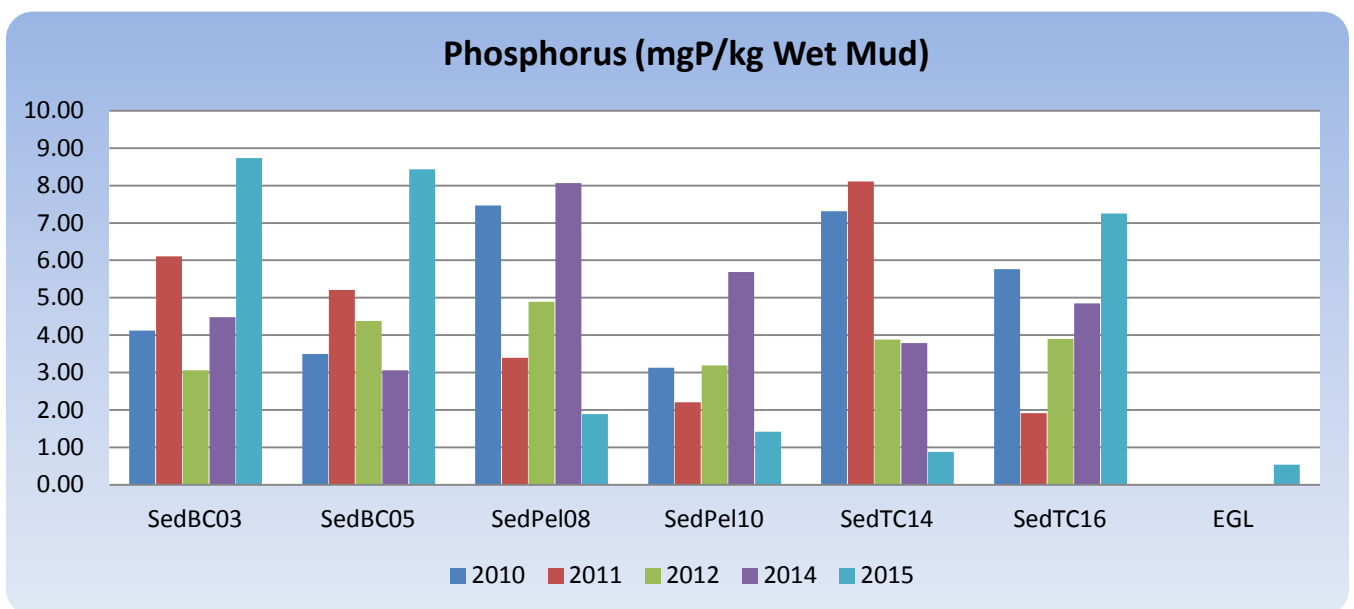


Figure 6 Comparison Phosphorus Content of Bottom Muds from 2010-2015