

Technical Memorandum BCWA



Date: February 8, 2017
To: Bear Creek Watershed Association
From: Russell N. Clayshulte, Manager
Re: BCWA TM 2016.01 Sediment Survey BCR

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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

A sediment sample 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. There was no sampling done in 2013 due to flooding and high reservoir volumes.



Figure 1 BCR Sample Site

Table 1 BCR Samples Collected

BCWA Dredge Sample Program 8/31/2016				
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

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 2). Table 3 compares the percentage TOC from 2010-2015.

Table 2 2016 TOC Results

	% Solids	TOC %
SedBC03	32%	11.2%
SedBC05	24%	11.5%
SedPel08	24%	9.8%
SedPel10	26%	8.5%
SedTC14	31%	11.2%
SedTC16	22%	10.9%

Table 3 2010-2016 TOC Comparison

	% Total Organic Carbon					
	2010	2011	2012	2014	2015	2016
SedBC03	11%	11%	9%	10.1%	9.5%	11%
SedBC05	10%	4%	11%	9.5%	12.2%	11%
SedPel08	11%	12%	13%	10.3%	12.2%	10%
SedPel10	13%	10%	11%	11.2%	10.1%	9%
SedTC14	12%	11%	10%	9.9%	1.8%	11%
SedTC16	10%	11%	13%	10.3%	9.2%	11%
EGL					16.0%	

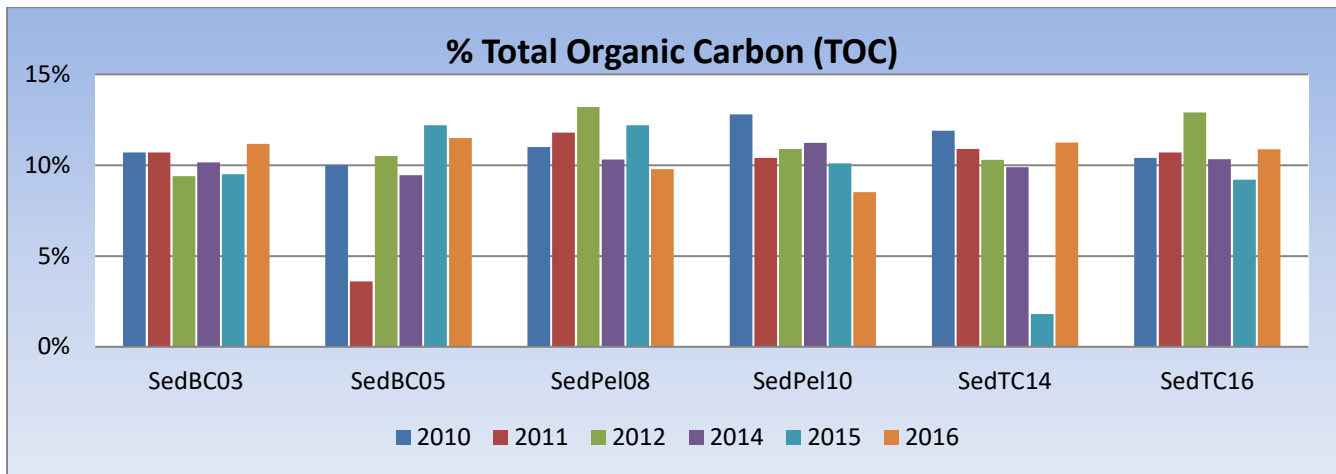


Figure 2 2010- 2016 TOC Percentage

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.

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	7%	11%	8%	20%	54%
BC05	2%	14%	16%	24%	44%
PEL08	6%	8%	12%	28%	46%

Grain Size % retained

Site	Coarse Sand	M Sand	F Sand	VF Sand	Silt & Clay
PEL10	2%	5%	19%	18%	56%
TC14	6%	12%	8%	21%	53%
TC16	2%	12%	12%	22%	69%

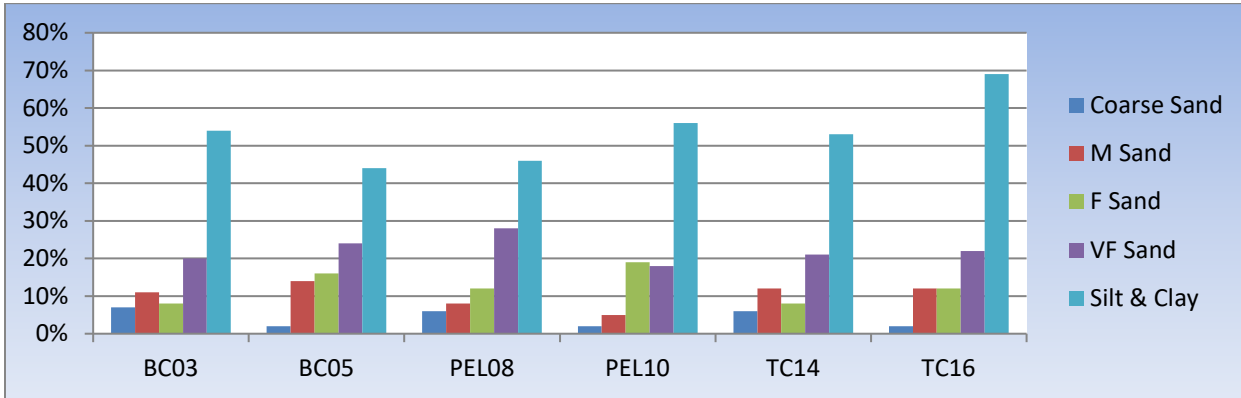


Figure 3 Grain Size Distributions

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 Figure 5).

Table 6 Total Phosphorus Data mgP/kg Mud

		mgP/kg Mud
Bear Creek Transect	SedBC03	0.65
	SedBC05	0.47
Pelican Point Transect	SedPel08	1.20
	SedPel10	3.97
Turkey Creek Transect	SedTC14	0.85
	SedTC16	3.64

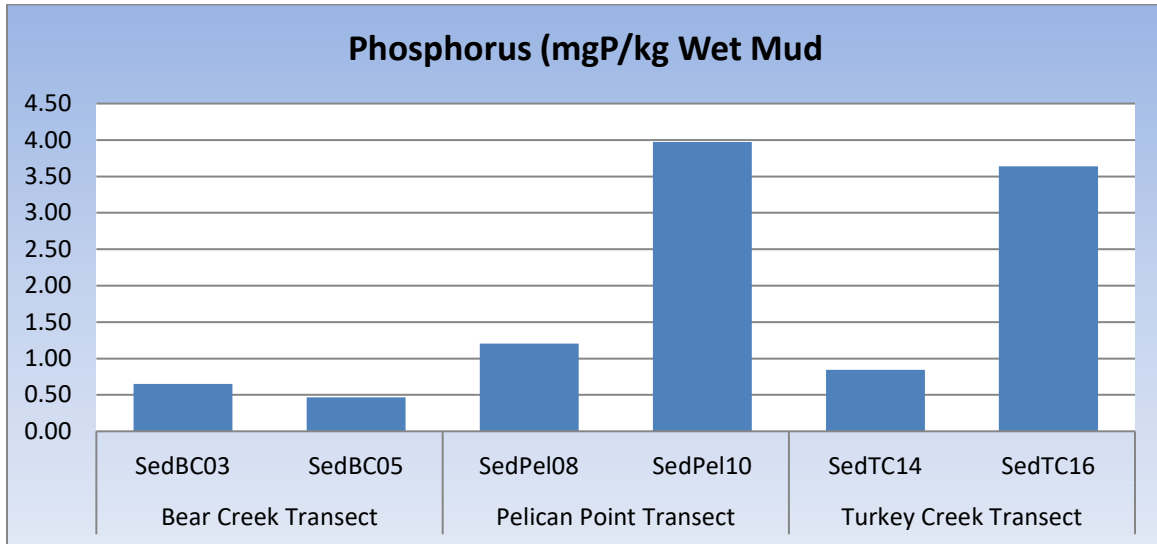


Figure 4 Phosphorus Distribution Along Transects BCR

Table 7 Comparison Phosphorus Content of Bottom Muds from 2010-2016

	Sediment Phosphorus (mgP/kg Wet Mud)						
	2010	2011	2012	2012 SePRO	2014	2015	2016
SedBC03	4.12	6.11	3.06	844.92	4.48	8.73	0.65
SedBC05	3.50	5.21	4.38	1129.92	3.06	8.43	0.47
SedPel08	7.47	3.39	4.89	1100.76	8.07	1.89	1.20
SedPel10	3.13	2.20	3.19	1052.08	5.69	1.42	3.97
SedTC14	7.32	8.11	3.88	632.82	3.79	0.88	0.85
SedTC16	5.76	1.91	3.90	831.88	4.85	7.25	3.64
EGL						0.54	

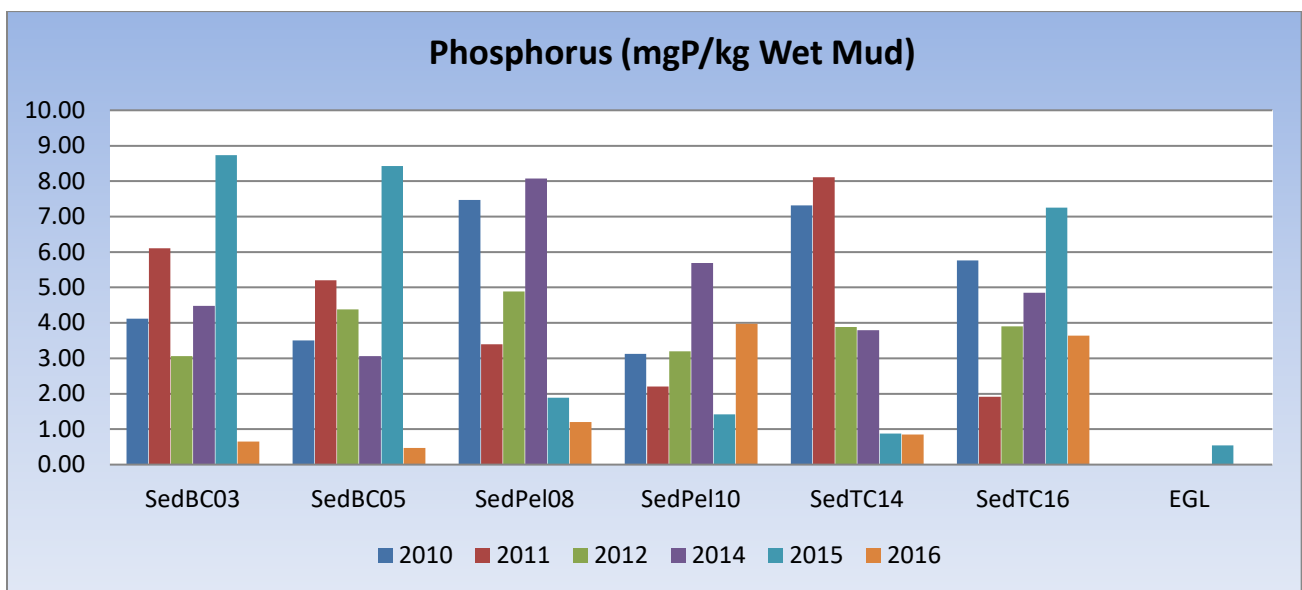


Figure 5 Comparison Phosphorus Content of Bottom Muds from 2010-2016