

2012 Monitoring Summary

Wolf Creek at Al. Highway 69 at Enon (Walker County) (33.67239/-87.38782)

BACKGROUND

A 38.4 mile segment of Wolf Creek from Alabama Highway 102 to Lost Creek has been on Alabama's Clean Water Act (CWA) §303(d) list of impaired waters since 1998. In 1998, it was listed for siltation caused by mining operations that are now abandoned. The 2012 data will be used to develop Total Maximum Daily Loads (TMDLs) for Wolf Creek.

The Alabama Department of Environmental Management (ADEM) also selected the Wolf Creek watershed for biological and water quality monitoring as part of the 2012 Assessment of the Black Warrior and Cahaba (BWC) River Basins. The objectives of the BWC River Basin Assessments were to assess the biological integrity of each monitoring site and to estimate overall water quality within the BWC River basin group.

Habitat and macroinvertebrate assessments were usually conducted as part of this project to assess the biological integrity of each monitoring site and to estimate overall water quality within the Black Warrior basin. Assessments of habitat quality and macroinvertebrate community condition could not be conducted for Wolf Creek at WOFW-4 due to low flow at the site.



Figure 1. Wolf Creek at WOFW-4, August 15, 2012.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Wolf Creek is a low-gradient *Fish and Wildlife (F&W)* stream located in the Shale Hills ecoregion (68f) (Figure 1). Based on the 2006 National Land Cover Dataset, land cover within the watershed is primarily forest (83%). As of June 6, 2013, ADEM's NPDES management database showed two permits have been issued in the watershed.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		Black Warrior River
Basin		Black Warrior River
Drainage Area (mi²)		85
Ecoregion^a		68f
% Landuse		
Open water		<1
Wetland	Woody	3
	Emergent herbaceous	<1
Forest	Deciduous	43
	Evergreen	29
	Mixed	11
Shrub/scrub		6
Grassland/herbaceous		4
Pasture/hay		2
Cultivated crops		<1
Development	Open space	2
	Low intensity	<1
	Moderate intensity	<1
Barren		<1
Population/km^{2b}		3
# NPDES Permits^c	TOTAL	2
Construction Stormwater		1
Mining		1

a. Shale Hills

b. 2000 US Census

c. #NPDES permits downloaded from ADEM's NPDES Management System database, June 6, 2013.

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 2. Generally, in situ measurements and water samples were collected monthly from April through November; metals were collected in April, June, and October. Median values for total dissolved solids and alkalinity were above the 90th percentile of all reference reach data collected in ecoregion 68. Specific conductance and hardness were found to be above the median values of all reference reach data for this ecoregion. Arsenic levels exceeded *F&W* Human Health criteria during one sampling event on Oct. 3, 2012.

SUMMARY

Low flow conditions in Wolf Creek at WOFW-4 prevented the completion of habitat and macroinvertebrate assessments. Total dissolved solids, specific conductance, hardness, alkalinity, and arsenic were all parameters of concern at this reach. Results may have been affected by stream flows during the sampling period. Additional monitoring will need to be conducted before biological conditions at this site can be assessed.

Table 2. Summary of water quality data collected April-November, 2012. Minimum (Min) and maximum (Max) values calculated using minimum detection limits (MDL) when results were less than this value for non-metals parameters. Median, average (Avg), and standard deviations (SD) values were calculated by multiplying the MDL by 0.5 when results were less than this value.

Parameter	N	Min	Max	Median	Avg	SD	E
Physical							
Temperature (°C)	7	12.0	23.0	18.6	18.5	3.7	
Turbidity (NTU)	7	3.0	12.0	4.1	5.3	3.2	
Total Dissolved Solids (mg/L)	6	164.0	478.0	276.0 ^M	303.7	108.6	
Total Suspended Solids (mg/L)	6	< 1.0	7.0	1.2	2.1	2.5	
Specific Conductance (µmhos)	7	225.3	485.5	417.1 ^G	408.0	87.8	
Hardness (mg/L)	3	84.8	186.0	156.0 ^G	142.3	52.0	
Alkalinity (mg/L)	6	40.1	79.7	63.2 ^M	61.7	14.5	
Chemical							
Dissolved Oxygen (mg/L)	6	6.7	9.3	7.2	7.5	0.9	
pH (su)	7	7.1	7.5	7.2	7.3	0.1	
Ammonia Nitrogen (mg/L)	6	< 0.007	< 0.008	0.004	0.004	0.000	
^J Nitrate+Nitrite Nitrogen (mg/L)	6	0.018	0.053	0.038	0.035	0.013	
^J Total Kjeldahl Nitrogen (mg/L)	6	< 0.041	0.153	0.058	0.070	0.048	
^J Total Nitrogen (mg/L)	6	< 0.058	0.192	0.093	0.105	0.054	
^J Dissolved Reactive Phosphorus (mg/L)	6	< 0.005	0.007	0.005	0.005	0.002	
Total Phosphorus (mg/L)	6	0.011	0.025	0.014	0.015	0.005	
^J CBOD-5 (mg/L)	6	< 2.0	< 2.0	1.0	1.0	0.0	
Chlorides (mg/L)	6	1.5	2.1	1.7	1.7	0.2	
Total Metals							
^J Aluminum (mg/L)	3	0.075	0.462	0.114	0.217	0.213	
Iron (mg/L)	3	0.321	0.862	0.378	0.520	0.297	
^J Manganese (mg/L)	3	0.045	0.078	0.047	0.057	0.018	
Dissolved Metals							
^J Aluminum (mg/L)	3	< 0.043	0.130	0.022	0.058	0.063	
Antimony (µg/L)	3	< 3.6	< 3.6	1.8	1.8	0.0	
^J Arsenic (µg/L)	3	< 1.8	2.4 ^H	0.9	1.4	0.8	1
Cadmium (µg/L)	3	< 0.022	< 0.046	0.011	0.015	0.007	
Chromium (mg/L)	3	< 0.009	< 0.009	0.004	0.004	0.000	
Copper (mg/L)	3	< 0.020	< 0.020	0.010	0.010	0.000	
^J Iron (mg/L)	3	0.045	0.337	0.100	0.161	0.155	
Lead (µg/L)	3	< 0.9	< 0.9	0.4	0.4	0.0	
^J Manganese (mg/L)	3	0.033	0.065	0.041	0.046	0.017	
Mercury (µg/L)	3	< 0.035	< 0.035	0.018	0.018	0.000	
Nickel (mg/L)	3	< 0.042	< 0.042	0.021	0.021	0.000	
Selenium (µg/L)	3	< 2.5	< 2.5	1.2	1.2	0.0	
Silver (µg/L)	3	< 0.015	< 0.215	0.008	0.041	0.058	
Thallium (µg/L)	3	< 1.4	< 1.4	0.7	0.7	0.0	
Zinc (mg/L)	3	< 0.012	< 0.012	0.006	0.006	0.000	
Biological							
Chlorophyll a (µg/L)	3	< 0.10	1.07	0.53	0.55	0.51	
^J E. coli (col/100mL)	3	32	119	99	83	45	

E=# samples that exceeded criteria; G=value higher than median concentration of all verified ecoregional reference reach data collected in the ecoregion 68; H=F&W human health criterion exceeded; J=estimate; M=value >90% of all verified ecoregional reference reach data collected in the ecoregion 68; N=# samples

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