

# 2012 Monitoring Summary



## Little Clear Creek in Winston County at County Road 369 (34.12919/-87.50900)

### BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Little Clear Creek watershed for biological and water quality monitoring as part of the 2012 Cahaba and Black Warrior River (CBW) Basin Assessments. Little Clear Creek is among the least disturbed watersheds in the Dissected Plateau ecoregion (68e), based on land use, road density, and population density; therefore, it has been selected as an ecological reference reach candidate. The 2012 data will be used to assess the biological integrity of the site and estimate overall water quality within the Black Warrior River Basin.



Figure 1. Little Clear Creek at LCLW-19, August 7, 2012.

### WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Little Clear Creek at LCLW-19 is a *Fish & Wildlife (F&W)* creek located within the Dissected Plateau ecoregion in Winston County. Based on the 2006 National Land Cover Dataset, land use within the watershed is composed primarily of forest (63%) and shrub and scrubland (15%). Population is low in the area, with little development. As of September 1, 2012, ADEM's NPDES Management System database showed two permitted discharges within the watershed.

### REACH CHARACTERISTICS

General observations (Table 2) and a habitat assessment (Table 3) were completed during the macroinvertebrate assessment. In comparison with reference reaches in the same ecoregion, they give an indication of the physical condition of the site and the quality and availability of habitat. Little Clear Creek at LCLW-19 is a high-gradient, riffle-run stream. Instream substrates were dominated by sand and gravel, with some cobble, organic matter and silt (Figure 1). Habitat quality and availability within the reach were rated *sub-optimal* for supporting macroinvertebrate communities.

### BIOASSESSMENT RESULTS

Benthic macroinvertebrate communities were sampled using ADEM's Intensive Multi-habitat Bioassessment methodology (WMB-I). The WMB-I uses measures of taxonomic richness, community composition, and community tolerance to assess the overall health of the macroinvertebrate community. Each metric is scored on a 100 point scale. The final score is the average of all individual metric scores. Metric results indicated the macroinvertebrate community to be characterized by pollution-intolerant taxa groups, indicating *good* community condition (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
<b>Basin</b>		Black Warrior River
<b>Drainage Area (mi<sup>2</sup>)</b>		8
<b>Ecoregion<sup>a</sup></b>		68e
<b>% Landuse</b>		
Open water		<1
Wetland	Woody	4
Forest	Deciduous	30
	Evergreen	21
	Mixed	12
Shrub/scrub		15
Grassland/herbaceous		4
Pasture/hay		8
Cultivated crops		1
Development	Open space	4
	Low intensity	1
	Moderate intensity	<1
Barren		<1
<b>Population/km<sup>2b</sup></b>		10
<b># NPDES Permits<sup>c</sup></b>	<b>TOTAL</b>	2
	Construction Stormwater	1
	Industrial General	1

a. Dissected Plateau

b. 2000 US Census

c. #NPDES permits downloaded from ADEM's NPDES Management System database, September 1, 2012.

Table 2. Physical characteristics of Little Clear Creek at LCLW-19, June 28, 2012.

Physical Characteristics		
<b>Width (ft)</b>		8
<b>Canopy Cover</b>		Shaded
<b>Depth (ft)</b>		
	Riffle	0.3
	Run	0.5
	Pool	2.5
<b>% of Reach</b>		
	Riffle	15
	Run	35
	Pool	50
<b>% Substrate</b>		
	Cobble	10
	Gravel	20
	Sand	55
	Silt	5
	Organic Matter	10

**Table 3.** Results of the habitat assessment conducted on Little Clear Creek at LCLW-19, June 28, 2012.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	63	Sub-optimal (59-70)
Sediment Deposition	63	Sub-optimal (59-70)
Sinuosity	73	Sub-optimal (65-84)
Bank and Vegetative Stability	55	Marginal (35-59)
Riparian Buffer	90	Optimal >89
<b>Habitat Assessment Score</b>	<b>161</b>	
<b>% Maximum Score</b>	<b>67</b>	Sub-optimal (59-70)

**Table 4.** Results of the macroinvertebrate bioassessment conducted in Little Clear Creek at LCLW-19, June 28, 2012.

Macroinvertebrate Assessment		
	Results	Scores (0-100)
<b>Taxa richness measures</b>		
# EPT taxa	30	100
<b>Taxonomic composition measures</b>		
% Non-insect taxa	7	79
% Dominant taxon	33	40
% EPC taxa	27	50
<b>Functional feeding group measures</b>		
% Predators	10	38
<b>Tolerance measures</b>		
% Taxa as Tolerant	21	81
<b>WMB-I Assessment Score</b>	<b>---</b>	<b>65</b>
<b>WMB-I Assessment Rating</b>		<b>Good (59-79)</b>

## WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. In situ measurements and water samples were collected monthly and semi-monthly (metals) during April through November of 2012 to help identify any stressors to the biological communities.

The median concentration of several metals and chlorides was higher than expected based on reference data collected in the Dissected Plateau ecoregion. Cadmium, and silver exceeded criteria applicable to Little Clear Creek's *F&W* use classification.

## SUMMARY

ADEM monitored Little Clear Creek as part of the Basin Assessment and as a "best attainable" condition reference reach for the Black Warrior River in 2012. Although habitat quality was categorized as *sub-optimal*, and the levels of chlorides and several metals were greater than expected, bioassessment results indicated the macroinvertebrate community to be in *good* condition.

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**Table 5.** 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. 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	Med	Avg	SD	E
<b>Physical</b>							
Temperature (°C)	5	13.3	23.5	22.7	19.7	4.7	
Turbidity (NTU)	5	6.0	11.4	8.2	8.7	2.2	
J Total Dissolved Solids (mg/L)	4	25.0	105.0	33.5	49.2	37.6	
J Total Suspended Solids (mg/L)	4	< 1.0	15.0	5.5	6.6	6.4	
Specific Conductance (µmhos)	5	29.0	56.0	33.0	36.8	11.1	
Hardness (mg/L)	4	7.5	10.5	8.5	8.8	1.3	
Alkalinity (mg/L)	4	6.0	10.3	7.5	7.8	2.1	
Stream Flow (cfs)	4	0.9	5.6	4.8	4.0	2.1	
<b>Chemical</b>							
Dissolved Oxygen (mg/L)	5	6.8	8.9	7.4	7.8	0.9	
pH (su)	5	6.6	7.8	6.8	7.0	0.5	
Ammonia Nitrogen (mg/L)	4	< 0.010	0.030	0.010	0.014	0.012	
Nitrate+Nitrite Nitrogen (mg/L)	4	0.023	0.281	0.114	0.133	0.108	
Total Kjeldahl Nitrogen (mg/L)	4	0.185	0.789	0.310	0.398	0.268	
Total Nitrogen (mg/L)	4	0.294	1.070	0.382	0.532	0.368	
J Dissolved Reactive Phosphorus (mg/L)	4	< 0.005	0.008	0.007	0.006	0.002	
Total Phosphorus (mg/L)	4	0.015	0.023	0.016	0.017	0.004	
J CBOD-5 (mg/L)	4	< 1.0	2.0	1.0	0.9	0.2	
J Chlorides (mg/L)	4	< 1.0	1.8	1.6 <sup>M</sup>	1.4	0.6	
<b>Total Metals</b>							
J Aluminum (mg/L)	4	0.103	0.269	0.172	0.179	0.078	
Iron (mg/L)	4	1.260	2.100	1.625 <sup>M</sup>	1.652	0.348	
Manganese (mg/L)	4	0.064	0.156	0.111 <sup>M</sup>	0.110	0.052	
<b>Dissolved Metals</b>							
J Aluminum (mg/L)	4	< 0.030	< 0.030	0.015	0.015	0.000	
J Antimony (µg/L)	4	< 0.8	< 0.8	0.4	0.4	0.0	
J Arsenic (µg/L)	4	< 1.0	< 1.0	0.5	0.5	0.0	
J Cadmium (µg/L)	4	< 0.090	0.150 <sup>C</sup>	0.045	0.071	0.052	1
Chromium (mg/L)	4	< 0.005	< 0.005	0.002	0.002	0.000	
Copper (mg/L)	4	< 0.100	0.300	0.150 <sup>M</sup>	0.125	0.050	
J Iron (mg/L)	4	0.294	0.719	0.372	0.440	0.199	
Lead (µg/L)	4	< 1.6	< 1.6	0.8	0.8	0.0	
Manganese (mg/L)	4	0.056	0.145	0.077 <sup>M</sup>	0.089	0.040	
Nickel (mg/L)	4	< 0.010	< 0.010	0.005	0.005	0.000	
Selenium (µg/L)	4	< 2.0	< 2.0	1.0	1.0	0.0	
J Silver (µg/L)	4	< 1.000	18.000 <sup>C</sup>	0.500	4.875	8.750	1
Thallium (µg/L)	4	< 0.4	0.4	0.2	0.2	0.0	
J Zinc (mg/L)	4	< 0.009	0.020	0.010	0.009	0.003	
<b>Biological</b>							
Chlorophyll a (µg/L)	4	< 1.00	2.14	0.50	0.91	0.82	
J E. coli (col/100mL)	4	38	461	80	165	199	

C= *F & W* criterion violated; E=# samples that exceeded criteria; J=estimate; M=value >90% of all verified ecoregional reference reach data collected in the ecoregion 68e; N= # samples.