

# 2010 Monitoring Summary



## Black Creek at Noccalula Road (Etowah County) (34.04118/-86.01998)

### BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Black Creek watershed for biological and water quality monitoring as part of the 2005 Assessment of the Alabama, Coosa, and Tallapoosa (ACT) River Basins. The objectives of these monitoring activities were to assess the biological integrity of each sampling location and to estimate overall water quality within the ACT basins. The 2005 assessment rated the macroinvertebrate community as *poor*. However, median concentrations of nutrients, total and dissolved solids and chlorides were similar to background conditions, based on the 90th percentile of reference reach data collected in the Southern Table Plateaus subecoregion of the Southwestern Appalachians.

The site was monitored again in 2010 to assess the macroinvertebrate community and identify the cause and source of any impairment.



Figure 1. Black Creek at BLKE-4 on May 5, 2010, facing upstream.

### WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Black Creek is a *Fish and Wildlife (F&W)* stream located in Etowah County in the town of Gadsden. Based on the 2006 National Land Cover Dataset, landuse within the watershed is primarily forest (63%), agriculture (19%), and development (7%). Eight NPDES permits have been issued in the Black Creek watershed, as of September 1, 2012.

### 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. The high percentage of bedrock substrate is characteristic of many stream reaches in this ecoregion. Bedrock naturally limits benthic habitat and is susceptible to scouring during high flow events. Black Creek at BLKE-4 is also susceptible to runoff because of the narrow riparian buffer.

### 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 in comparison to reference reaches in the same ecoregion. Based on the updated indices, metric results indicated the macroinvertebrate community to be in *fair* condition (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Coosa River
Drainage Area (mi <sup>2</sup> )		54
Ecoregion <sup>a</sup>		68d
% Landuse		
Open water		<1
Wetland	Woody	1
	Emergent herbaceous	<1
	Deciduous	34
Forest	Evergreen	14
	Mixed	15
	Shrub/scrub	
Grassland/herbaceous		2
Pasture/hay		16
Cultivated crops		3
Development	Open space	6
	Low intensity	1
	Moderate intensity	<1
Barren		<1
Population/km <sup>2b</sup>		155
# NPDES Permits <sup>c</sup>	TOTAL	8
	Construction Stormwater	6
	Municipal Individual	2

a. Southern Table Plateaus

b. 2000 US Census

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

Table 2. Physical characteristics of Black Creek at BLKE-4, May 26, 2010.

Physical Characteristics		
Width (ft)		55
Canopy Cover		Mostly Open
Depth (ft)		
	Riffle	0.5
	Run	1.5
	Pool	2.5
% of Reach		
	Riffle	5
	Run	85
	Pool	10
% Substrate		
	Bedrock	81
	Boulder	2
	Cobble	3
	Gravel	4
	Sand	2
	Silt	5
	Organic Matter	3

**Table 3.** Results of the habitat assessment conducted on Black Creek at BLKE-4, May 26, 2010.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	55	Marginal (41-58)
Sediment Deposition	85	Optimal >70
Sinuosity	90	Optimal >84
Bank and Vegetative Stability	68	Sub-optimal (60-74)
Riparian Buffer	20	Poor <50
<b>Habitat Assessment Score</b>	<b>155</b>	
<b>% Maximum Score</b>	<b>65</b>	<b>Sub-optimal (59-70)</b>

**Table 4.** Results of macroinvertebrate bioassessment conducted in Black Creek at BLKE-4, May 26, 2010.

Macroinvertebrate Assessment		
	Results	Scores
<b>Taxa richness measures</b>		<b>(0-100)</b>
# EPT taxa	13	39
<b>Taxonomic composition measures</b>		
% Non-insect taxa	9	68
% Dominant taxon	25	62
% EPC taxa	20	24
<b>Functional feeding group measures</b>		
% Predators	5	13
<b>Tolerance measures</b>		
% Taxa as Tolerant	33	46
<b>WMB-I Assessment Score</b>	---	<b>42</b>
<b>WMB-I Assessment Rating</b>		<b>Fair (39-58)</b>

## WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. In situ measurements and water samples were collected May, July, September, and November of 2010 to help identify any stressors to the biological communities. Samples could not be collected in September because the streambed was dry. Dissolved arsenic exceeded the Human Health criterion, May 5, 2010 and November 4, 2010. Median chlorophyll *a*, dissolved iron and manganese were elevated, based on data collected at reference reaches within the Southern Table Plateaus ecoregion (68d). Nutrient concentrations were similar to reference conditions. Pesticides and semi-volatile organics were collected at BLKE-4 on July 15th and November 4th, but all parameters were below detection limits.

## SUMMARY

Based on the 2005 and 2010 data, the primary stressors to the macroinvertebrate community in Black Creek at BLKE-4 are lack of instream habitat and extreme flows. The high percentage of bedrock limited instream habitat, and was susceptible to scouring during extreme flow events. Flows were very low during 2010, which may have further limited available habitat.

Dissolved arsenic concentrations exceeded Human Health criterion. However, additional low-level arsenic sampling may be necessary to determine if the criterion exceedances are due to natural conditions or anthropogenic sources.

**Table 5.** Summary of water quality data collected May-November, 2010. Minimum (Min) and maximum (Max) values calculated using minimum detection limits (MDL). Median (Med), 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)	4	14.7	27.2	20.7	20.8	5.3	
Turbidity (NTU)	4	3.6	13.8	6.7	7.7	4.4	
Total Dissolved Solids (mg/L)	3	38.0	126.0	50.0	71.3	47.7	
Total Suspended Solids (mg/L)	3	< 1.0	8.0	2.0	3.5	4.0	
Specific Conductance (µmhos)	4	41.2	196.1	59.2	88.9	72.6	
Hardness (mg/L)	3	13.0	77.5	26.6	39.0	34.0	
Alkalinity (mg/L)	3	7.5	64.4	32.8	34.9	28.5	
Stream Flow (cfs)	4	1.1	137.1	12.2	40.6	65.1	
<b>Chemical</b>							
Dissolved Oxygen (mg/L)	4	7.1	8.7	8.0	8.0	0.7	
pH (su)	4	6.7	7.3	6.9	6.9	0.3	
Ammonia Nitrogen (mg/L)	3	< 0.021	0.021	0.010	0.010	0.000	
Nitrate+Nitrite Nitrogen (mg/L)	3	0.073	0.189	0.110	0.124	0.059	
Total Kjeldahl Nitrogen (mg/L)	3	< 0.080	0.389	0.325	0.251	0.186	
Total Nitrogen (mg/L)	3	< 0.229	0.462	0.435	0.375	0.127	
Dissolved Reactive Phosphorus (mg/L)	3	< 0.004	0.007	0.004	0.004	0.002	
Total Phosphorus (mg/L)	3	0.011	0.020	0.015	0.015	0.004	
CBOD-5 (mg/L)	3	< 2.0	2.0	1.0	1.0	0.0	
Chlorides (mg/L)	3	1.6	7.3	2.6	3.8	3.0	
Atrazine (µg/L)	2	< 0.02	0.02	0.01	0.01	0.00	
<b>Total Metals</b>							
Aluminum (mg/L)	3	< 0.033	0.329	0.068	0.138	0.168	
Iron (mg/L)	3	0.399	0.968	0.483	0.617	0.307	
Manganese (mg/L)	3	0.058	0.185	0.120	0.121	0.064	
<b>Dissolved Metals</b>							
Aluminum (mg/L)	3	< 0.033	0.043	0.016	0.018	0.003	
Antimony (µg/L)	3	< 1.9	1.9	0.9	0.9	0.0	
Arsenic (µg/L)	3	< 1.6	2.69 <sup>H</sup>	1.6	1.8	0.8	2
Cadmium (µg/L)	3	< 0.014	14.000	1.500	2.836	3.683	
Chromium (mg/L)	3	< 0.009	0.013	0.006	0.006	0.001	
Copper (mg/L)	3	< 0.013	0.020	0.006	0.008	0.002	
Iron (mg/L)	3	< 0.026	0.187	0.173 <sup>M</sup>	0.124	0.097	
Lead (µg/L)	3	< 1.7	1.7	0.8	0.8	0.0	
Manganese (mg/L)	3	< 0.001	0.130	0.082 <sup>M</sup>	0.071	0.065	
Mercury (µg/L)	3	< 0.080	0.080	0.040	0.040	0.000	
Nickel (mg/L)	3	< 0.019	0.042	0.010	0.013	0.007	
Selenium (µg/L)	3	< 1.7	1.7	0.8	0.8	0.0	
Silver (µg/L)	3	< 0.015	2.000	0.008	0.338	0.573	
Thallium (µg/L)	3	< 0.6	0.6	0.3	0.3	0.0	
Zinc (mg/L)	3	< 0.012	0.030	0.015	0.012	0.005	
<b>Biological</b>							
Chlorophyll <i>a</i> (ug/L)	3	1.07	2.14	2.14 <sup>M</sup>	1.78	0.62	
E. coli (col/100mL)	3	148	276	186	203	65	

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

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