

# 2007 Monitoring Summary



Basin Assessment Site

**Jock Creek** at mouth at unnamed road in Tuscaloosa County (33.45310/-87.42820)

## BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Jock Creek watershed for biological and water quality monitoring as part of the [2007 Black Warrior Cahaba \(BWC\) Basin Assessment Monitoring](#). The objectives of the study were to assess each monitoring location and estimate overall water quality within the basin. Data collected from this project will also be used for metric and criteria development.



Figure 1. Watershed Characteristics of Jock Creek at JKC-1.

## WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Jock Creek is a small [Fish & Wildlife \(F&W\)](#) stream that drains through two square miles in the Tuscaloosa County. Based on the 2000 National Land Cover Dataset, landuse within the watershed is primarily forest (77%) (Figure 1), interspersed with some shrubs and grasslands. Population density is relatively very low in this area. As of February 23, 2011, only two NPDES permits have been issued in this monitoring site.

## 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. Jock Creek at JKC-1 is a moderate gradient stream with bedrock, gravel, cobble, boulder, and sand substrates. This watershed lies in the Shale Hills sub ecoregion (68f). Overall habitat quality was categorized as *optimal*.

## 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 the scores of all individual metrics. Metric results indicated the macroinvertebrate community to be characterized mainly by pollution-tolerant taxa groups, indicating *poor* 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>		2
<b>Ecoregion<sup>a</sup></b>		68f
<b>% Landuse</b>		
Open water		<1
Forest	Deciduous	31
	Evergreen	36
	Mixed	10
Shrub/scrub		15
Grassland/herbaceous		4
Development	Open space	1
	Low intensity	<1
Barren		1
<b>Population/km<sup>2</sup><sup>b</sup></b>		<1
<b># NPDES Permits<sup>c</sup></b>	<b>TOTAL</b>	2
	Mining	1
	Municipal Individual	1

a.Shale Hills

b.2000 US Census

c.#NPDES permits downloaded from ADEM's NPDES Management System database, February 23, 2011.

Table 2. Physical characteristics of Jock Creek at JKC-1, May 9, 2007.

Physical Characteristics	
<b>Width (ft)</b>	6
<b>Canopy Cover</b>	Shaded
<b>Depth (ft)</b>	
	Riffle 0.3
	Run 0.5
	Pool 1.5
<b>% of Reach</b>	
	Riffle 35
	Run 30
	Pool 35
<b>% Substrate</b>	
	Bedrock 33
	Boulder 10
	Cobble 20
	Gravel 25
	Sand 5
	Silt 3
	Organic Matter 4

**Table 3.** Results of the habitat assessment conducted on Jock Creek at

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	68	Sub-optimal (59-70)
Sediment Deposition	77	Optimal >70
Sinuosity	88	Optimal >84
Bank and Vegetative Stability	71	Sub-optimal (60-74)
Riparian Buffer	90	Optimal >89
<b>Habitat Assessment Score</b>	<b>176</b>	
<b>% Maximum Score</b>	<b>73</b>	<b>Optimal &gt;70</b>

**Table 4.** Results of the macroinvertebrate bioassessment conducted in Jock Creek at JKC-1, May 9, 2007.

Macroinvertebrate Assessment			
	Results	Scores	Rating
	(0-100)		
<b>Taxa richness measures</b>			
# Ephemeroptera (mayfly) genera	1	8	Very Poor (<23)
# Plecoptera (stonefly) genera	2	33	Fair (32-49)
# Trichoptera (caddisfly) genera	6	50	Fair (45-66)
<b>Taxonomic composition measures</b>			
% Non-insect taxa	11	57	Fair (49.5-74.1)
% Non-insect organisms	2	94	Fair (62.8-93.9)
% Plecoptera	3	16	Fair (13.2-19.7)
<b>Tolerance measures</b>			
Beck's community tolerance index	12	43	Fair (41.0-60.9)
<b>WMB-I Assessment Score</b>	<b>--</b>	<b>43</b>	<b>Poor (24-48)</b>

## WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. [In situ measurements](#) and [water samples](#) were collected monthly, semi-monthly (metals), or once (pesticides, atrazine, and semi-volatile organics) during March through October of 2007 to help identify any stressors to the biological communities. *In situ* parameters suggested that Jock Creek at JKC-1 was meeting its [F&W](#) use classification criteria, although stream pH exceeded the criterion during one sampling event. Median values of total dissolved solids, specific conductance, hardness, alkalinity, and chlorides were higher than expected based on ecoregional reference data collected in the ecoregion 68.

## SUMMARY

Bioassessment results indicated the macroinvertebrate community to be in *poor* condition, although the habitat assessment score was *optimal* with good instream habitat. Macroinvertebrate communities in very small stream are typically not as diverse as communities further downstream. However, total dissolved solids, specific conductance, alkalinity, hardness and chlorides were elevated as compared to data from ADEM's least-impaired reference reaches in ecoregion 68. Elevated concentrations of total dissolved solids, specific conductance, hardness, alkalinity and chlorides are potential causes of the degraded biological conditions within the reach.

**Table 5.** Summary of water quality data collected March-October, 2007. Minimum (Min) and maximum (Max) values calculated using minimum detection limits (MDL). 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	Q	E
<b>Physical</b>								
Temperature (°C)	9	14.7	25.9	22.1	21.1	3.4		
Turbidity (NTU)	9	0.6	6.8	1.4	2.5	2.1		
Total Dissolved Solids (mg/L)	8	188.0	1,008.0	355.5 <sup>M</sup>	414.4	246.9		
Total Suspended Solids (mg/L)	8	< 1.0	25.0	3.0	7.2	8.8		
Specific Conductance (µmhos)	9	432.6	3,642.0	529.7 <sup>G</sup>	887.6	1,035.4		
Hardness (mg/L)	5	118.0	270.0	227.0 <sup>G</sup>	212.4	59.6		
Alkalinity (mg/L)	8	44.3	56.7	52.8 <sup>M</sup>	51.9	4.0		
Stream Flow (cfs)	8	0.1	6.4	0.7	1.4	2.1		
<b>Chemical</b>								
Dissolved Oxygen (mg/L)	9	7.2	10.9	8.7	8.7	1.0		
pH (su)	9	7.2	8.8 <sup>C</sup>	7.5	7.6	0.5	1	
Ammonia Nitrogen (mg/L)	8	< 0.015	< 0.015	0.008	0.008	0.000		
Nitrate+Nitrite Nitrogen (mg/L)	8	< 0.002	0.160	0.070	0.074	0.061		
Total Kjeldahl Nitrogen (mg/L)	8	< 0.150	0.170	0.075	0.087	0.034		
Total Nitrogen (mg/L)	8	< 0.076	0.259	0.148	0.161	0.073		
Dissolved Reactive Phosphorus (mg/L)	8	0.011	0.048	0.014	0.019	0.012		
Total Phosphorus (mg/L)	8	0.012	0.053	0.020	0.023	0.013	J	
CBOD-5 (mg/L)	8	< 1.0	1.4	0.5	0.8	0.4		
Chlorides (mg/L)	8	6.6	15.3	10.8 <sup>M</sup>	11.2	3.0	J	
Atrazine (µg/L)	1				0.08			
<b>Total Metals</b>								
Aluminum (mg/L)	5	< 0.015	0.200	0.023	0.080	0.093	J	
Iron (mg/L)	5	0.028	0.180	0.050	0.073	0.061	J	
Manganese (mg/L)	5	0.010	0.071	0.061	0.047	0.028	J	
<b>Dissolved Metals</b>								
Aluminum (mg/L)	6	< 0.015	0.190	0.008	0.045	0.073		
Antimony (µg/L)	6	< 0.2	< 2.0	1.0	0.8	0.3		
Arsenic (µg/L)	4	< 0.5	< 5.0	1.1	1.2	0.9		
Cadmium (mg/L)	6	< 0.000	0.005	0.002	0.002	0.001		
Chromium (mg/L)	6	< 0.002	0.010	0.002	0.002	0.001		
Copper (mg/L)	6	< 0.005	0.010	0.002	0.003	0.001		
Iron (mg/L)	6	< 0.005	0.060	0.002	0.008	0.011		
Lead (µg/L)	6	< 1.1	5.0	0.7	0.1	0.7		
Manganese (mg/L)	6	0.010	0.100	0.014	0.029	0.035	J	
Mercury (µg/L)	6	< 0.0	0.5 <sup>A</sup>	0.1	0.1	0.1	J	1
Nickel (mg/L)	6	< 0.004	0.010	0.003	0.003	0.001		
Selenium (µg/L)	6	< 1.6	5.0	0.8	1.1	0.7		
Silver (mg/L)	5	< 0.000	0.003	0.002	0.001	0.001		
Thallium (µg/L)	5	< 0.6	2.5	0.3	0.6	0.4		
Zinc (mg/L)	6	< 0.002	2.500	0.003	0.210	0.509		
<b>Biological</b>								
Chlorophyll a (ug/L)	8	< 0.10	3.20	0.94	1.20	1.10	J	
Fecal Coliform (col/100 mL)	8	20	170	60	78	60	J	

A=(F&W) aquatic life criterion exceeded; C=(F&W) criterion violated; G=value> median of all ecoregional reference reach data collected(68); J=estimate; M=value> 90th percentile of all verified ecoregional reference reach data collected within ecoregion(68); N=# samples; Q=Laboratory qualifier code.

FOR MORE INFORMATION, CONTACT:  
Sreeletha P Kumar, ADEM Environmental Indicators Section  
1350 Coliseum Boulevard Montgomery, AL 36110  
(334) 260-2782 skumar@adem.state.al.us