

2007 Monitoring Summary



Big Black Creek at Jefferson County Road 10 near Whites Chapel (33.595861/-86.531639)

BACKGROUND

Big Black Creek was placed on Alabama's Clean Water Act (CWA) [1998 §303\(d\) list](#) of impaired waters for not meeting its [Fish and Wildlife \(F&W\)](#) water use classification. It was listed for siltation and other habitat alteration due to abandoned surface mining. Based on monitoring conducted in 1999, Big Black Creek was delisted in 2000.

The Alabama Department of Environmental Management (ADEM) monitored Big Black Creek at BLCC-1 in 2007 to further investigate impairment resulting from abandoned surface mining. Macroinvertebrate and habitat assessments were conducted to verify impairment to aquatic communities. Monthly water chemistry samples were collected to identify the cause of impairment. Results from these data may also be used in the determination of Total Maximum Daily Load (TMDL) needs and priorities.

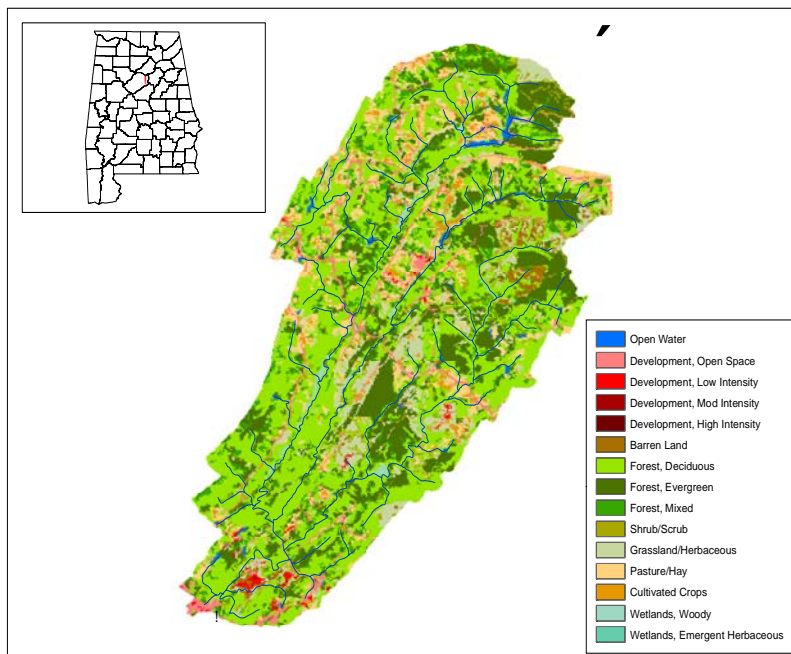


Figure 1. Landuse in Big Black Creek watershed at BLCC-1.

WATERSHED CHARACTERISTICS

Big Black Creek at BLCC-1 is located within the Southern Sandstone Ridges ecoregion ([Griffith et al. 2001](#)) in Jefferson County. Based on the 2000 National Landcover Dataset (NLCD), landuse within the watershed was composed primarily of forested areas (70%), with some agriculture (10%) (Table 1, Figure 1). Development activities accounted for approximately 6% of the watershed. As of February 23, 2011, the ADEM has issued 100 NPDES permits, 91 of which are related to construction stormwater activities.

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. Big Black Creek at BLCC-1 is a small, mostly-open stream reach. This high gradient stream was characterized by a predominantly sand substrate with cobble and gravel present. Pools, which are deeper areas with lower velocities, comprised 80 percent of the stream reach. Overall habitat quality was categorized as *marginal* due to excessive sedimentation and poor riparian vegetative protection resulting in limited instream habitat quality.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin	Cahaba River	
Drainage Area (mi ²)	39	
Ecoregion ^a	67h	
% Landuse		
Open water	<1	
Wetland	Woody	1
Forest	Deciduous	44
	Evergreen	19
	Mixed	7
Shrub/scrub	4	
Grassland/herbaceous	9	
Pasture/hay	8	
Cultivated crops	2	
Development	Open space	4
	Low intensity	1
	Moderate intensity	<1
Barren	1	
Population/km ^{2b}	12	
# NPDES Permits ^c	TOTAL	100
401 Water Quality Certification	2	
Construction Stormwater	91	
Industrial General	2	
Municipal Individual	1	
Underground Injection Control	4	

a.Southern Sandstone Ridges

b.2000 US Census

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

Table 2. Physical characteristics of Big Black Creek at BLCC-1, May 29, 2007.

Physical Characteristics		
Canopy Cover	Mostly Open	
Depth (Ft)		
	Riffle	0.3
	Run	1.5
	Pool	3.0
% of Reach		
	Riffle	5
	Run	15
	Pool	80
% Substrate		
	Boulder	2
	Cobble	20
	Gravel	20
	Sand	42
	Silt	10
	Organic Matter	6

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Table 3. Results of the habitat assessment conducted on Big Black Creek at BLCC-1, May 29, 2007.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	51	Marginal (41-58)
Sediment Deposition	49	Marginal (41-58)
Sinuosity	70	Sub-optimal (65-84)
Bank and Vegetative Stability	65	Sub-optimal (60-74)
Riparian Buffer	65	Marginal (50-69)
Habitat Assessment Score	139	
% Maximum Score	58	Marginal (41-58)

Table 4. Results of the macroinvertebrate bioassessment conducted in BLCC-1, May 29, 2007.

Macroinvertebrate Assessment			
	Results	Scores	Rating
		(0-100)	
Taxa richness measures			
# Ephemeroptera (mayfly) genera	3	25	Poor (23-46)
# Plecoptera (stonefly) genera	1	17	Poor (16-31)
# Trichoptera (caddisfly) genera	6	50	Fair (45-66)
Taxonomic composition measures			
% Non-insect taxa	14	44	Poor (24.7-49.4)
% Non-insect organisms	5	86	Fair (62.8-93.9)
% Plecoptera	0	0	Very Poor (<6.56)
Tolerance measures			
Beck's community tolerance index	5	18	Very Poor (<20.2)
WMB-I Assessment Score	--	34	Poor (24-48)

Table 5. Summary of water quality data collected March-October, 2007. 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
Physical						
Temperature (°C)	6	18.0	23.6	21.8	21.5	1.9
Turbidity (NTU)	6	6.8	10.2	8.5	8.7	1.2
Total Dissolved Solids (mg/L)	5	170.0	288.0	241.0 ^M	244.2	48.4
Total Suspended Solids (mg/L)	5	<1.0	7.0	1.0	2.3	2.7
Specific Conductance (µmhos)	6	331.9	525.0	415.0 ^G	422.3	63.2
Alkalinity (mg/L)	5	105.5	170.2	115.9 ^M	126.7	26.3
Stream Flow (cfs)	5	0.4	2.1	1.1	1.3	0.8
Chemical						
Dissolved Oxygen (mg/L)	6	6.3	7.5	7.0	7.0	0.4
pH (su)	6	7.4	8.0	7.7	7.7	0.3
Ammonia Nitrogen (mg/L)	5	<0.015	0.101	0.008	0.032	0.041
Nitrate+Nitrite Nitrogen (mg/L)	5	0.089	0.209	0.168 ^M	0.155	0.055
Total Kjeldahl Nitrogen (mg/L)	5	<0.150	0.374	0.169	0.195	0.132
Total Nitrogen (mg/L)	5	<0.182	0.542	0.372	0.351	0.134
^J Dissolved Reactive Phosphorus (mg/L)	5	0.004	0.016	0.009	0.010	0.004
^J Total Phosphorus (mg/L)	5	0.017	0.024	0.021	0.021	0.002
CBOD-5 (mg/L)	5	<1.0	2.2	0.5	0.8	0.8
^J Chlorides (mg/L)	5	2.9	3.4	3.2	3.1	0.3
Biological						
^J Fecal Coliform (col/100 mL)	5	10	180	26	73	77

G=value higher than median concentration of all verified ecoregional reference reach data collected in the ecoregion 67h; J=estimate; M=value >90% of all verified ecoregional reference reach data collected in the ecoregion 67h; N=# samples.

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 in *poor* condition (Table 4). Very few pollution-intolerant taxa were collected at the site.

WATER CHEMISTRY

[In situ measurements](#) and [water samples](#) were collected monthly, during March through October of 2007 to help identify any stressors to the biological communities. Water chemistry results are summarized in Table 5. Median nitrate+nitrite-nitrogen concentrations, total dissolved solids, and alkalinity were higher than the 90th percentile of data collected at reference reaches in ecoregion 67h. Specific conductance was higher than the median value of data collected at reference reaches in this ecoregion.

SUMMARY

As part of the [assessment process](#), ADEM will review the monitoring information presented in this report, along with all other available data.

Big Black Creek was placed on Alabama's Clean Water Act (CWA) [1998 §303\(d\) list](#) of impaired waters for not meeting its [Fish and Wildlife \(F&W\)](#) water use classification. It was listed for siltation and other habitat alteration due to abandoned surface mining. Results of the 2007 bioassessment indicated the macroinvertebrate community in Big Black Creek at BLCC-1 to be in *poor* condition, indicating impairment to biological communities potentially caused by nutrient (nitrogen) loading.

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