

2007 Monitoring Summary



Big Brush Creek on Hale County Road 21 (32.78504/-87.65406)

BACKGROUND

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



Figure 1. Big Brush Creek at BBRH-42D, July 11, 2012.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Big Brush Creek is a small *Fish & Wildlife (F&W)* stream located north of Greensboro in the Black Warrior River basin. According to the 2000 National Land Cover Dataset, landuse within the watershed is primarily forest (75%). As of February 23, 2011, four outfalls were active in this 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. Big Brush Creek at BBRH-42D is a low-gradient, sand-bottomed stream (Figure 1). Overall habitat quality was categorized as *sub-optimal* for supporting diverse aquatic 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 in *poor* condition (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin	Black Warrior River	
Drainage Area (mi ²)	132	
Ecoregion ^a	65i	
% Landuse		
Open water	<1	
Wetland	Woody	7
	Emergent herbaceous	<1
Forest	Deciduous	31
	Evergreen	25
	Mixed	19
Shrub/scrub	9	
Grassland/herbaceous	<1	
Pasture/hay	2	
Cultivated crops	2	
Development	Open space	3
	Low intensity	<1
Barren	<1	
Population/km ^{2b}	22	
# NPDES Permits ^c	TOTAL	4
	Construction Stormwater	4

a. Fall Line Hills

b. 2000 US Census

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

Table 2. Physical characteristics at Big Brush Creek, BBRH-42D, May 2, 2007.

Physical Characteristics	
Width (ft)	30
Canopy Cover	Estimate 50/50
Depth (ft)	
Run	2.5
Pool	4.0
% of Reach	
Run	40
Pool	60
% Substrate	
Sand	89
Silt	5
Organic Matter	6

Table 3. Results of the habitat assessment conducted on Big Brush Creek at BBRH-42D, May 2, 2007.

Habitat Assessment	% Maximum Score	Rating
Instream Habitat Quality	42	Marginal (40-52)
Sediment Deposition	50	Marginal (40-52)
Sinuosity	50	Marginal (45-64)
Bank and Vegetative Stability	54	Marginal (35-59)
Riparian Buffer	73	Sub-optimal (70-89)
Habitat Assessment Score	119	
% Maximum score	54	Sub-optimal (53-65)

Table 4. Results of the macroinvertebrate bioassessment conducted in Big Brush Creek at BBRH-42D, May 2, 2007.

Macroinvertebrate Assessment		
	Results	Rating
Taxa richness measures		
# EPT genera	11	Fair (38-56)
Taxonomic composition measures		
% Non-insect taxa	18	Poor (30.9-61.8)
% Plecoptera	1	Fair (3.8-5.6)
% Dominant taxa	38	Poor (23.5-47.0)
Functional composition measures		
% Predators	14	Good (45.3-72.1)
Tolerance measures		
Beck's community tolerance index	4	Poor (10.6-21.2)
% Nutrient tolerant organisms	24	Fair (50.9-76.2)
WMB-I Assessment Score	--	Poor (19-37)

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 quarterly (pesticides, herbicides (atrazine), and semi-volatile organics) during March through October of 2007 to help identify any stressors to the biological communities. Median values of specific conductance, hardness, total iron, and dissolved iron were higher than expected when compared to verified data of reference reaches in the same ecoregion. Turbidity was also higher than expected for the ecoregion on July 10, 2007. However, stream flow on this date was above normal at the time of sampling. Zinc exceeded the criterion applicable to Big Brush Creek's F&W use classification in one of three samples collected.

SUMMARY

Habitat assessment results indicated the habitat to be in *sub-optimal* condition. The water quality results indicated elevated levels of zinc, specific conductance, hardness, and iron. These results indicate the need for further monitoring to help identify the cause of the biological deterioration of the stream.

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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	E
Physical							
Temperature (°C)	8	12.5	25.2	20.2	20.1	4.4	
Turbidity (NTU)	8	9.5	106.0 ^T	15.8	25.6	32.6	
Total Dissolved Solids (mg/L)	7	38.0	122.0	60.0	68.0	30.8	
Total Suspended Solids (mg/L)	7	3.0	120.0	9.0	24.4	42.3	
Specific Conductance (µmhos)	8	39.9	80.6	58.0 ^G	59.8	17.2	
Hardness (mg/L)	2	13.0	30.0	21.5 ^G	21.5	12.0	
Alkalinity (mg/L)	7	1.9	33.7	12.5	15.4	10.9	
Stream Flow (cfs)	2	20.4	39.5	30.0	30.0	13.5	
Chemical							
Dissolved Oxygen (mg/L)	8	5.6	9.2	6.7	7.2	1.2	
pH (su)	8	6.0	7.1	6.9	6.8	0.4	
Ammonia Nitrogen (mg/L)	7	< 0.015	0.245	0.028	0.054	0.086	
Nitrate+Nitrite Nitrogen (mg/L)	7	< 0.003	1.670	0.183	0.352	0.595	
Total Kjeldahl Nitrogen (mg/L)	7	< 0.150	1.710	0.385	0.498	0.558	
Total Nitrogen (mg/L)	7	< 0.076	3.380	0.568	0.850	1.148	
^J Dissolved Reactive Phosphorus (mg/L)	7	0.006	0.098	0.016	0.035	0.036	
Total Phosphorus (mg/L)	5	0.036	0.073	0.043	0.047	0.015	
CBOD-5 (mg/L)	7	< 1.0	1.7	0.5	0.9	0.5	
^J Chlorides (mg/L)	7	2.6	4.3	2.9	3.1	0.6	
Atrazine (µg/L)	1			< 0.05			
Total Metals							
Aluminum (mg/L)	3	0.200	0.290	0.290	0.260	0.052	
Iron (mg/L)	3	2.000	4.310	4.310 ^M	3.540	1.334	
Manganese (mg/L)	3	0.552	1.600	0.552	0.901	0.605	
Dissolved Metals							
Aluminum (mg/L)	3	< 0.100	0.140	0.050	0.080	0.052	
Antimony (µg/L)	3	< 1.6	< 5.0	0.8	1.4	1.0	
Arsenic (µg/L)	3	< 0.5	< 5.0	0.2	1.0	1.3	
Cadmium (µg/L)	3	< 0.030	< 0.200	0.015	0.043	0.049	
Chromium (µg/L)	3	< 2.000	< 10.000	5.000	4.000	1.732	
Copper (mg/L)	3	< 0.003	< 0.010	0.005	0.004	0.001	
Iron (mg/L)	3	0.540	0.960	0.960 ^M	0.820	0.242	
Lead (µg/L)	3	< 1.1	< 5.0	0.6	1.2	1.1	
Manganese (mg/L)	3	0.500	1.610	0.500	0.870	0.641	
Mercury (µg/L)	3	< 0.500	< 0.500	0.250	0.250	0.000	
Nickel (mg/L)	3	< 0.005	< 0.010	0.005	0.005	0.000	
Selenium (µg/L)	3	< 1.6	< 5.0	0.8	1.4	1.0	
Silver (µg/L)	3	< 0.040	< 0.500	0.020	0.097	0.133	
Thallium (µg/L)	3	< 1.2	2.5	0.6	0.8	0.4	
Zinc (mg/L)	3	0.028	0.030 ^S	0.030	0.029	0.001	1
Biological							
^J Chlorophyll a (ug/L)	7	< 0.10	7.12	1.60	2.12	2.61	
^J Fecal Coliform (cd/100 mL)	7	27	1800	110	350	645	

E=# of samples that exceeded criteria; G=value higher than median concentration of all verified ecoregional reference reach data collected in the ecoregion 65i; J=estimate; N=# samples; M=value > 90% of all data collected within ecoregion 65i; S=hardness-adjusted aquatic life use criteria exceeded; T=value exceeds 50 NTU above the 90th percentile of all verified