Alabama Department of Environmental Management

303(d)/TMDL

Rivers and Streams Monitoring Program

2012 Monitoring Summary

Fair-Poor™

Black Branch at Coal Valley Road (Walker County) (33.73807/-87.41524)

BACKGROUND

A 3.15 mile segment of Black Branch from its source to Cane Creek has been on Alabama's Clean Water Act (CWA) §303(d) list of impaired waters since 1998. In 1998, it was listed for metals (aluminum and iron), pH, and siltation caused by mining operations that are now abandoned. The 2012 data will be used to develop Total Maximum Daily Loads (TMDLs) for Black Branch.

The Alabama Department of Environmental Management (ADEM) also selected the Black Branch watershed for biological and water quality monitoring as part of the 2012 Assessment of the Black Warrior and Cahaba (BWC) River Basins. The objectives of the BWC River Basin Assessments were to assess the biological integrity of each monitoring site and to estimate overall water quality within the BWC River basin group. A habitat and a macroinvertebrate assessment were conducted on Black Branch at BKBW-1 on May, 8, 2012.

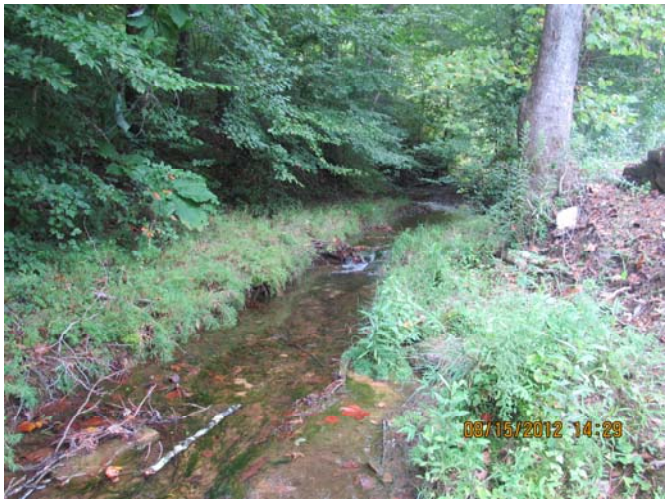

Figure 1. Black Branch at BKBW-1, October 15, 2012.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Black Branch at BKBW-1 is a *Fish & Wildlife (F&W)* stream located in Walker County. Based on the 2000 National Land Cover Dataset, landuse within the watershed is primarily forest (94%). As of June 6, 2013, a total of 2 NPDES permits have been issued in 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. Black Branch at BKBW-1 is a riffle-run stream located in the Shale Hills ecoregion (68f) (Figure 1). Benthic substrate consists primarily of bedrock, cobble, and gravel. Overall habitat quality was rated as *sub-optimal* for supporting a diverse biological community.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Black Warrior River
Drainage Area (mi^2)		3
Ecoregion[a]		68f
% Landuse		
Open water		1
Wetland	Woody	2
Forest	Deciduous	56
	Evergreen	24
	Mixed	14
Shrub/scrub		3
Grassland/herbaceous		<1
Pasture/hay		<1
Development	Open space	<1
Population/km^2[b]		3
# NPDES Permits[c]	**TOTAL**	2
Mining		2

a.Shale Hills

b.2000 US Census

c.#NPDES permits downloaded from ADEM's NPDES Management System database, June 6, 2013.

Table 2. Physical Characteristics of Black Branch at BKBW-1, May 8, 2012.

Physical Characteristics		
Width (ft)		10
Canopy cover		Est. 50/50
Depth (ft)		
	Riffle	0.3
	Run	1.0
	Pool	0.5
% of Reach		
	Riffle	5
	Run	85
	Pool	10
% Substrate		
	Bedrock	35
	Boulder	5
	Cobble	18
	Gravel	30
	Sand	2
	Silt	6
	Organic Matter	4

BIOASSESSMENT RESULTS

Benthic macroinvertebrate communities were sampled using ADEM's Intensive Multi-habitat Bioassessment methodology (WMB-I). The WMB-I measures taxonomic richness, community composition, and community tolerance to assess the overall health of the macroinvertebrate community in comparison to conditions expected in north Alabama streams and rivers. Each score is based on a six-point scale, ranging from 1, or *natural*, to 6, or *highly altered*. The macroinvertebrate survey conducted in Black Branch at BKBW-1 rated the site as *fair-poor*. Relative abundance and numbers of pollution-sensitive taxa are lower than expected, while relative abundance and numbers of pollution-tolerant taxa have increased (Table 4).

Table 3. Results of the habitat assessment conducted on Black Branch at BKBW-1, May 8, 2012.

Habitat Assessment	% Maximum Score	Rating
Instream Habitat Quality	63	Sub-optimal (59-70)
Sediment Deposition	75	Optimal >70
Sinuosity	85	Optimal >84
Bank and Vegetative Stability	69	Sub-optimal (60-74)
Riparian Buffer	33	Poor <50
Habitat Assessment Score	**157**	
% Maximum score	**65**	**Sub-optimal (59-70)**

Table 4. Results of the macroinvertebrate bioassessment conducted in Black Branch at BKBW-1, May 8, 2012.

Macroinvertebrate Assessment	
	Results
Taxa richness measures	
Total # Taxa	48
# EPT taxa	7
# Sensitive EPT	2
# Highly-sensitive and Specialized Taxa	0
Taxonomic composition measures	
% EPC taxa	15
% Non-insect taxa	4
% Dominant taxon	36
Functional feeding group measures	
% Predators	21
Tolerance measures	
% Sensitive taxa	19
% Taxa as Tolerant	29
WMB-I Assessment Score	4-
WMB-I Assessment Rating	Fair-poor

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. When possible, in situ measurements and water samples were collected monthly during April through November to help identify any stressors to the biological communities. Specific conductance and hardness values were higher than median values for all verified ecoregional reference reach data for streams in ecoregion 68. Total dissolved solids, total and dissolved aluminum, total and dissolved manganese, and dissolved zinc concentrations were above 90 percent of data for streams in this ecoregion. Arsenic concentrations exceeded Human Health criteria for *Fish and Wildlife* streams on Oct. 3, and thallium concentrations exceeded criteria on May 2 and Oct 3. During eight sampling events from May to November, pH was below criteria for Black Branch's *F&W* use classification, and was also below 90 percent of all verified ecoregional reference reach data for streams in ecoregion 68.

SUMMARY

Bioassessment results indicated the macroinvertebrate community in Black Branch at BKBW-1 to be in *fair-poor* condition. Overall habitat quality was categorized as *sub-optimal* for supporting a diverse macroinvertebrate community. Water chemistry analyses resulted in low pH levels, high conductivity and hardness, and high concentrations of several dissolved and total metals.

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	Median	Avg	SD	E
Physical							
Temperature (°C)	9	12.3	25.8	22.6	21.1	4.0	
Turbidity (NTU)	9	0.4	2.5	1.0	1.1	0.7	
Total Dissolved Solids (mg/L)	8	290.0	626.0	397.0 M	446.2	114.0	
Total Suspended Solids (mg/L)	8	< 1.0	< 1.0	0.5	0.5	0.0	
Specific Conductance (µmhos)	9	402.1	712.0	561.7 G	577.9	96.1	
Hardness (mg/L)	8	143.0	287.0	225.5 G	224.8	46.4	
J Alkalinity (mg/L)	8	< 0.8	4.5	0.8	1.3	1.4	
Stream Flow (cfs)	4	0.3	2.3	1.6	1.4	0.8	
Chemical							
Dissolved Oxygen (mg/L)	9	7.7	9.5	8.3	8.4	0.6	
pH (su)	9	4.3	6.7	5.1 CM	5.2	0.7	8
Ammonia Nitrogen (mg/L)	8	< 0.007	0.033	0.004	0.008	0.010	
J Nitrate+Nitrite Nitrogen (mg/L)	8	< 0.005	0.076	0.038	0.033	0.025	
J Total Kjeldahl Nitrogen (mg/L)	8	< 0.041	0.090	0.020	0.031	0.024	
J Total Nitrogen (mg/L)	8	< 0.023	0.135	0.063	0.064	0.039	
J Dissolved Reactive Phosphorus (mg/L)	8	< 0.004	0.006	0.002	0.004	0.002	
J Total Phosphorus (mg/L)	8	0.004	0.009	0.006	0.006	0.002	
J CBOD-5 (mg/L)	8	< 2.0	< 2.0	1.0	1.0	0.0	
Chlorides (mg/L)	8	1.3	1.6	1.6	1.5	0.1	
Total Metals							
J Aluminum (mg/L)	8	0.073	2.420	0.674 M	1.014	0.905	
J Iron (mg/L)	8	0.063	0.139	0.098	0.102	0.029	
Manganese (mg/L)	8	0.452	1.570	1.105 M	1.080	0.368	
Dissolved Metals							
J Aluminum (mg/L)	8	0.044	2.400	0.625 M	0.962	0.916	
Antimony (µg/L)	8	< 3.6	< 3.6	1.8	1.8	0.0	
J Arsenic (µg/L)	8	< 1.8	2.9 H	0.9	1.1	0.7	1
J Cadmium (µg//L)	8	0.047	0.112	0.086	0.084	0.024	
Chromium (mg/L)	8	< 0.009	< 0.009	0.004	0.004	0.000	
Copper (mg/L)	8	< 0.020	< 0.020	0.010	0.010	0.000	
J Iron (mg/L)	8	< 0.019	0.124	0.066	0.071	0.038	
J Lead (µg/L)	8	< 0.9	< 0.9	0.4	0.5	0.2	
Manganese (mg/L)	8	0.438	1.550	1.070 M	1.063	0.366	
Mercury (µg/L)	8	< 0.035	< 0.035	0.018	0.018	0.000	
J Nickel (mg/L)	8	< 0.042	0.045	0.021	0.027	0.011	
Selenium (µg/L)	8	< 2.5	< 2.5	1.2	1.2	0.0	
Silver (µg//L)	8	< 0.015	< 0.215	0.108	0.070	0.052	
J Thallium (µg/L)	8	< 1.4	1.9 H	0.7	0.9	0.5	2
J Zinc (mg/L)	8	< 0.012	0.061	0.035 M	0.033	0.024	
Biological							
Chlorophyll a (µg/L)	4	< 0.10	0.27	0.16	0.16	0.13	
J E. coli (col/100 mL)	4	15	46	31	31	13	

C=*F&W* criterion exceeded; E=# samples that exceeded criteria; G=value higher than median concentration of all verified ecoregional reference reach data collected in the ecoregion 68; H=Human Health criterion exceeded; J=estimate; M=value >90% of all verified ecoregional reference reach data collected in the ecoregion 68; N=# samples.

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