

2012 Monitoring Summary



Cane Creek on mining land (Walker County) (33.68765/-87.30972)

BACKGROUND

A 7.15 mile segment of Cane Creek from Dixie Springs Road to Lost 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), nutrients, pH, organic enrichment, and siltation caused by mining operations that are now abandoned. The 2012 data will be used to develop Total Maximum Daily Loads (TMDLs) for Cane Creek.

The Alabama Department of Environmental Management (ADEM) also selected the Cane Creek 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 Cane Creek at CANW-1A on May, 16, 2012.



Figure 1. Cane Creek at CANW-1A, February 23, 2012.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Cane Creek at CANW-1A 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 (77%). As of June 6, 2013, a total of 3 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. Cane Creek at CANW-1A is a glide-pool stream located in the Shale Hills ecoregion (68f) (Figure 1). Benthic substrate consists primarily of gravel and sand. Overall habitat quality was rated as *marginal* for supporting a diverse biological community.

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. Each score is based on a 100 point scale in comparison to least-impaired reference reaches in the same ecoregion. The final score is the average of all individual metric scores. The metric results indicated the macroinvertebrate community to be in *fair* condition (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Black Warrior River
Drainage Area (mi ²)		24
Ecoregion ^a		68f
% Landuse		
Open water		<1
Wetland	Woody	3
	Emergent herbaceous	<1
Forest	Deciduous	32
	Evergreen	33
	Mixed	12
Shrub/scrub		6
Grassland/herbaceous		5
Pasture/hay		3
Cultivated crops		<1
Development	Open space	3
	Low intensity	<1
	Moderate intensity	<1
	High intensity	<1
Barren		1
Population/km ^{2b}		23
# NPDES Permits ^c	TOTAL	3
	Construction Stormwater	1
	Mining	1
	Industrial General	1

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 Cane Creek at CANW-1A, May 16, 2012.

Physical Characteristics		
Canopy Cover		Mostly Shaded
Width (ft)		38.0
Depth (Ft)		
	Run	2.0
	Pool	4.0
% of Reach		
	Run	70
	Pool	30
% Substrate		
	Boulder	3
	Clay	5
	Cobble	5
	Mud/Muck	5
	Gravel	30
	Sand	31
	Silt	10
	Organic Matter	11

Table 3. Results of the habitat assessment conducted on Cane Creek at CANW-1A, May 16, 2012.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	59	Sub-optimal (59-70)
Sediment Deposition	63	Sub-optimal (59-70)
Sinuosity	43	Poor <45
Bank and Vegetative Stability	53	Marginal (35-59)
Riparian Buffer	66	Marginal (50-69)
Habitat Assessment Score	130	
% Maximum Score	59	Marginal (41-58)

Table 4. Results of the macroinvertebrate bioassessment conducted in Cane Creek at CANW-1A, May 16, 2012.

Macroinvertebrate Assessment		
	Results	Scores (0-100)
Taxa richness measures		
# EPT taxa	8	17
Taxonomic composition measures		
% Non-insect taxa	12	52
% Dominant taxon	20	77
% EPC taxa	16	28
Functional feeding group measures		
% Predators	18	77
Tolerance measures		
% Taxa as Tolerant	35	39
WMB-I Assessment Score	---	48
WMB-I Assessment Rating		Fair (39-58)

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, hardness, and alkalinity values were higher than median values for all verified ecoregional reference reach data for streams in ecoregion 68. Total dissolved solids, dissolved manganese, and dissolved silver concentrations were above 90 percent of data for streams in this ecoregion. Arsenic concentrations exceeded Human Health criteria for *Fish and Wildlife* streams on October 4 and November 7, and thalium concentrations exceeded criteria on October 4.

SUMMARY

Overall habitat quality was categorized as *marginal* for supporting a diverse macroinvertebrate community. Bioassessment results indicated the macroinvertebrate community in Cane Creek at CANW-1A to be in *fair* condition. Water chemistry analyses showed high conductivity, hardness and alkalinity. Also, total dissolved solids, dissolved manganese, and dissolved silver levels were higher than expected. These levels could be potential causes of stressors to the biological community in the Cane Creek watershed.

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	11.7	24.4	20.7	19.6	3.9	
Turbidity (NTU)	9	1.7	6.1	2.9	3.0	1.3	
Total Dissolved Solids (mg/L)	8	674.0	1172.0	1018.0 ^M	972.0	169.7	
Total Suspended Solids (mg/L)	8	< 1.0	8.0	0.5	1.5	2.6	
Specific Conductance (µmhos)	9	907.1	1491.0	1229.0 ^G	1246.1	188.8	
Hardness (mg/L)	8	429.0	697.0	626.0 ^G	603.4	90.4	
Alkalinity (mg/L)	8	140.0	244.0	193.0 ^G	192.5	34.1	
Stream Flow (cfs)	4	8.3	16.3	10.9	11.6	3.5	
Chemical							
Dissolved Oxygen (mg/L)	9	6.2	9.1	7.3	7.4	1.1	
pH (su)	9	7.5	7.9	7.7	7.7	0.1	
Ammonia Nitrogen (mg/L)	8	< 0.007	0.032	0.004	0.007	0.010	
^J Nitrate+Nitrite Nitrogen (mg/L)	8	0.015	0.229	0.090	0.090	0.066	
^J Total Kjeldahl Nitrogen (mg/L)	8	< 0.041	0.494	0.126	0.172	0.162	
^J Total Nitrogen (mg/L)	8	< 0.080	0.590	0.251	0.262	0.174	
^J Dissolved Reactive Phosphorus (mg/L)	8	0.005	0.008	0.006	0.006	0.001	
Total Phosphorus (mg/L)	8	0.010	0.018	0.014	0.014	0.003	
CBOD-5 (mg/L)	8	< 2.0	< 2.0	1.0	1.0	0.0	
Chlorides (mg/L)	8	1.7	3.2	2.2	2.3	0.5	
Total Metals							
^J Aluminum (mg/L)	8	< 0.043	0.137	0.066	0.071	0.034	
^J Iron (mg/L)	8	0.098	0.227	0.154	0.156	0.037	
Manganese (mg/L)	8	0.079	0.168	0.138	0.131	0.033	
Dissolved Metals							
^J Aluminum (mg/L)	8	< 0.043	0.044	0.022	0.024	0.008	
Antimony (µg/L)	8	< 3.6	< 3.6	1.8	1.8	0.0	
^J Arsenic (µg/L)	8	< 1.8	3.2 ^H	0.9	1.3	0.8	2
^J Cadmium (mg/L)	8	< 0.022	0.046	0.023	0.018	0.006	
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	0.031	0.010	0.017	0.011	
Lead (µg/L)	8	< 0.9	< 0.9	0.4	0.4	0.0	
Manganese (mg/L)	8	0.078	0.156	0.128 ^M	0.124	0.031	
Mercury (µg/L)	8	< 0.035	0.035	0.018	0.018	0.000	
Nickel (mg/L)	8	< 0.042	< 0.042	0.021	0.021	0.000	
^J Selenium (µg/L)	8	< 2.5	< 2.5	1.2	1.2	0.0	
^J Silver (mg/L)	8	< 0.015	0.215	0.108 ^M	0.070	0.052	
^J Thallium (µg/L)	8	< 1.4	1.9 ^H	0.7	0.8	0.4	1
^J Zinc (mg/L)	8	< 0.012	0.018	0.006	0.009	0.005	
Biological							
Chlorophyll a (µg/L)	8	< 0.10	0.53	0.27	0.26	0.20	

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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