ADEM
Alabama Department of Environmental Management
TMDL Site

2012 Monitoring Summary

Poor ™

Daniel Creek at Coal bed Methane pad off of Davis Road in Tuscaloosa County (33.30502/-87.38513)

BACKGROUND

Daniel Creek was placed on Alabama's Clean Water Act (CWA) 2006 §303(d) list of impaired waters for not meeting its *Fish and Wildlife* (*F&W*) water use classification. It was listed for impairment caused by metals (Cr and Pb) from abandoned surface mining. In 2012, the Alabama Department of Environmental Management (ADEM) monitored Daniel Creek at DNCT-2 to further investigate extent of these impairments. 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.

The ADEM also selected the Daniel Creek watershed for biological and water quality monitoring as part of the 2012 Black Warrior/Cahaba (BWC) Basin Assessment Monitoring. 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 basins.

Figure 1. Daniel Creek at DNCT-2, May 7, 2012.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Daniel Creek is a small *Fish & Wildlife (F&W)* stream located in Tuscaloosa County in the Shale Hills ecoregion (68f). Based on the 2006 National Land Cover Dataset, landuse within the watershed is primarily forest (65%), followed by grassland and shrub/scrub. Population density is relatively low. As of September 1, 2012, ADEM has issued 12 NPDES permits 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. Daniel Creek at DNCT-2 is a low gradient stream with sand, silt, and gravel substrates (Figure 1). Overall habitat quality was categorized as *marginal* due to lack of instream habitat and high sediment deposition.

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 in comparison to least impaired reference reaches in the same ecoregion. The final score is the average of all individual metric scores. Metric results indicated the macroinvertebrate community to be in *poor* community condition (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Black Warrior River
Drainage Area (mi^2)		18
Ecoregion[a]		68f
% Landuse		
Open water		1
Wetland	Woody	1
	Emergent herbaceous	<1
Forest	Deciduous	20
	Evergreen	34
	Mixed	11
Shrub/scrub		9
Grassland/herbaceous		10
Pasture/hay		<1
Cultivated crops		<1
Development	Open space	3
	Low intensity	1
	Moderate intensity	<1
	High intensity	<1
Barren		9
Population/km^2 [b]		10
# NPDES Permits[c]	**TOTAL**	12
Construction Stormwater		3
Mining		6
Industrial General		2
Underground Injection Control		1

a. Shale Hills
b. 2000 US Census
c. #NPDES permits downloaded from ADEM's NPDES Management System database, September 1, 2012.

Table 2. Physical characteristics of Daniel Creek at DNCT-2, May 7, 2012.

Physical Characteristics		
Canopy Cover		Open
Width (ft)		30
Depth (ft)		
	Run	1.5
	Pool	1.5
% of Reach		
	Run	95
	Pool	5
% Substrate		
	Gravel	2
	Sand	80
	Silt	12
	Organic Matter	6

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Table 3. Results of the habitat assessment conducted on Daniel Creek at DNCT-2, May 7, 2012.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	20	Poor <41
Sediment Deposition	34	Poor <41
Sinuosity	45	Marginal (45-64)
Bank and Vegetative Stability	74	Sub-optimal (60-74)
Riparian Buffer	83	Sub-optimal (70-89)
Habitat Assessment Score	**103**	
% Maximum Score	**47**	**Marginal (41-58)**

Table 4. Results of the macroinvertebrate bioassessment conducted in Daniel Creek at DNCT-2, May 7, 2012.

Macroinvertebrate Assessment	Results	Scores
		(0-100)
Taxa richness measures		
# EPT taxa	0	0
Taxonomic composition measures		
% Non-insect taxa	11	60
% Dominant taxon	25	62
% EPC taxa	0	0
Functional feeding group measures		
% Predators	44	100
Tolerance measures		
% Taxa as Tolerant	53	0
WMB-I Assessment Score	---	**37**
WMB-I Assessment Rating		**Poor (20-38)**

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. In situ measurements and water samples were collected from April through November 2012 to help identify any stressors to the biological communities. Stream flows were visible, but not measurable (in July and November, and estimated to be <0.1 cfs. Median concentrations of conductivity, hardness, total dissolved solids, alkalinity, chlorides, and metals (total iron, manganese, dissolved manganese) were higher than expected based on verified reference reach data collected in the ecoregion 68.

SUMMARY

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

Bioassessment results indicated the macroinvertebrate community to be in *poor* condition. Habitat was assessed as *marginal* for supporting macroinvertebrate communities. Specific conductance, hardness, alkalinity, total dissolved solids, total iron, and manganese, and dissolved manganese were higher than expected for this ecoregion.

Table 5. Summary of water quality data collected April-November, 2012. 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
Physical						
Temperature (°C)	10	11.0	27.2	22.3	21.6	5.0
Turbidity (NTU)	10	5.7	53.9	14.0	18.8	15.2
J Total Dissolved Solids (mg/L)	8	527.0	1300.0	902.5 M	891.6	273.4
J Total Suspended Solids (mg/L)	8	2.0	291.0	14.0	50.5	98.3
Specific Conductance (µmhos)	10	7.6	1698.0	1,060.1 G	1021.2	444.3
Hardness (mg/L)	8	248.0	496.0	423.0 G	395.8	92.0
Alkalinity (mg/L)	8	44.5	548.2	62.4 M	139.8	174.9
Stream Flow (cfs)	10	<0.1	51.3	10.5	16.1	17.9
Chemical						
Dissolved Oxygen (mg/L)	10	7.7	11.2	8.6	8.8	1.0
pH (su)	10	6.8	8.2	7.5	7.5	0.4
J Ammonia Nitrogen (mg/L)	8 <	0.010	0.058	0.018	0.026	0.021
J Nitrate+Nitrite Nitrogen (mg/L)	8	0.090	0.713	0.177	0.259	0.205
J Total Kjeldahl Nitrogen (mg/L)	8	0.123	0.564	0.290	0.297	0.144
J Total Nitrogen (mg/L)	8	0.315	0.836	0.522	0.556	0.211
J Dissolved Reactive Phosphorus (mg/L)	7 <	0.004	0.014	0.004	0.005	0.004
Total Phosphorus (mg/L)	8 <	0.004	0.189	0.007	0.032	0.064
J CBOD-5 (mg/L)	8 <	1.0	< 2.0	1.0	0.9	0.2
Chlorides (mg/L)	8	10.8	64.9	21.0	25.0	17.2
Total Metals						
J Aluminum (mg/L)	8 <	0.030	0.889	0.184	0.260	0.287
J Iron (mg/L)	8 <	0.100	2.930	1.680 M	1.696	0.910
Manganese (mg/L)	8	0.646	1.530	1.255 M	1.146	0.352
Dissolved Metals						
J Aluminum (mg/L)	8 <	0.030	0.084	0.015	0.028	0.024
J Antimony (µg/L)	8 <	0.8	2.8	0.4	0.8	0.8
J Arsenic (µg/L)	8 <	1.0	< 1.0	0.5	0.5	0.0
J Cadmium (µg/L)	8 <	0.090	0.146	0.045	0.058	0.036
Chromium (mg/L)	8 <	0.005	< 0.005	0.002	0.002	0.000
Copper (mg/L)	8 <	0.100	< 0.300	0.150	0.112	0.052
J Iron (mg/L)	8 <	0.100	0.173	0.050	0.065	0.043
J Lead (µg/L)	8 <	1.6	< 1.6	0.8	0.8	0.0
Manganese (mg/L)	8	0.574	1.470	1.100 M	1.067	0.358
Nickel (mg/L)	8 <	0.010	< 0.010	0.005	0.005	0.000
Selenium (µg/L)	8 <	2.0	< 2.0	1.0	1.0	0.0
J Silver (µg/L)	8 <	1.000	< 1.000	0.500	0.500	0.000
Thallium (µg/L)	8 <	0.4	< 0.4	0.2	0.2	0.0
J Zinc (mg/L)	8 <	0.009	< 0.020	0.010	0.009	0.002
Biological						
Chlorophyll a (µg/L)	4 <	1.00	2.14	0.50	0.91	0.82
J E. coli (col/100mL)	8	8	548	28	136	215

G=value > median concentration of all verified reference reach data collected in the ecoregion 68; J=estimate; M=value > 90th percentile of all verified ecoregional reference reach data collected within ecoregions 68; N=# samples.