ADEM
Alabama Department of Environmental Management
Basin Assessment

Rivers and Streams Monitoring Program

2007 Monitoring Summary

™

Fair

Daniel Creek adjacent to Camp Cherry Austin Road in Tuscaloosa County (33.29500/-87.36440)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Daniel Creek watershed for biological and water quality monitoring as part of the 2007 Assessment of the Black Warrior/Cahaba River basins. Daniel Creek, from the Black Warrior River to its source, 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 metals from abandoned surface mining.

The ADEM monitored Daniel Creek at DNC-1 to document impairment from metals. 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 Total Maximum Daily Load (TMDL) determinations, which is scheduled for 2014.

Figure 1. Daniel Creek at DNC-1, August 22, 2007.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Daniel Creek at DNC-1 is located in the Black Warrior River basin and drains approximately 15 square miles within the Shale Hills ecoregion of Tuscaloosa County. Based on the 2006 National Land Cover Dataset, landuse within the watershed was composed of forest (71%), shrub/scrub, and grasslands (Table 1). As of September 1, 2012, ADEM had issued 14 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 DNC-1 is a small, mostly-shaded stream reach (Figure 1). Bottom substrate consists primarily of gravel and sand with some boulder, cobble, and silt present. Overall habitat quality and availability were rated as *optimal* for supporting diverse aquatic macroinvertebrate communities. However, flow was low during the assessment and limited root bank habitat.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Black Warrior River
Drainage Area (mi^2)		15
Ecoregion[a]		68f
% Landuse		
Open water		<1
Wetland	Woody	1
	Emergent herbaceous	<1
Forest	Deciduous	21
	Evergreen	37
	Mixed	13
Shrub/scrub		9
Grassland/herbaceous		8
Pasture/hay		1
Cultivated crops		<1
Development	Open space	4
	Low intensity	1
	Moderate intensity	<1
	High intensity	<1
Barren		6
Population/km^2[b]		1
# NPDES Permits[c]	**TOTAL**	14
Construction Stormwater		1
Mining		10
Industrial General		1
Industrial Individual		1
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 DNC-1, May 10, 2007.

Physical Characteristics		
Width (ft)		30
Canopy Cover		Mostly Shaded
Depth (ft)		
	Riffle	1.5
	Run	0.5
	Pool	2.0
% of Reach		
	Riffle	25
	Run	70
	Pool	5
% Substrate		
	Boulder	10
	Cobble	3
	Gravel	41
	Sand	36
	Silt	2
	Organic Matter	8

Table 3. Results of the habitat assessment conducted on Daniel Creek at DNC-1, May 10, 2007.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	71	Optimal >70
Sediment Deposition	63	Sub-optimal (59-70)
Sinuosity	85	Optimal >84
Bank and Vegetative Stability	81	Optimal >74
Riparian Buffer	90	Optimal >89
Habitat Assessment Score	**175**	
% Maximum Score	**73**	**Optimal >70**

Table 4. Results of the macroinvertebrate bioassessment conducted in DNC-1, June 21, 2006.

Macroinvertebrate Assessment	Results	Scores (0-100)
Taxa richness measures		
# EPT taxa	8	17
Taxonomic composition measures		
% Non-insect taxa	5	90
% Dominant taxon	23	69
% EPC taxa	18	32
Functional feeding group measures		
% Predators	8	27
Tolerance measures		
% Taxa as Tolerant	34	42
WMB-I Assessment Score	---	**46**
WMB-I Assessment Rating		**Fair (39-58)**

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 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 *fair* condition (Table 4).

WATER CHEMISTRY

Water chemistry results are summarized in Table 5. In situ measurements and water samples were collected monthly, during March through November of 2007 to help identify any stressors to the biological communities. Median specific conductance and hardness were greater than median concentrations of all verified reference data collected in ecoregion 68f. Median alkalinity, chlorides, total iron, dissolved lead and dissolved selenium were higher than the 90th percentile of all verified reference data collected in ecoregion 68f. The estimated mercury concentration exceeded the established criterion for *F&W* water use classification during the August site visit.

SUMMARY

As part of the assessment process, ADEM will review the monitoring information presented in this report, along with all other available data. Results from these data may also be used in the determination of Total Maximum Daily Load (TMDL) needs and priorities.

Results of the 2007 bioassessment indicated the macroinvertebrate community in Daniel Creek at DNC-1 to be in *fair* condition. Water quality data reveal median values of total iron, dissolved arsenic, dissolved lead, and dissolved selenium exceeded the 90th percentile of all verified reference data collected in ecoregion 68f and median mercury exceeded established criteria for *F&W* water use classification during the August site visit, verifying impairment from metals from abandoned surface mining.

Table 5. Summary of water quality data collected March-November, 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	Q
Physical									
Temperature (°C)	9		11.2	29.5	21.5	20.0	6.1		
Turbidity (NTU)	9		1.0	2.8	1.8	1.7	0.6		
Total Dissolved Solids (mg/L)	8		15.0	1216.0	827.0	743.2	359.4		
Total Suspended Solids (mg/L)	8	<	1.0	17.0	4.0	4.6	5.2		
Specific Conductance (µmhos)	9		443.0	2017.0	1378.0 G	1331.7	418.3		
Hardness (mg/L)	7		226.0	443.0	343.0 G	343.7	82.0		
Alkalinity (mg/L)	8		76.5	102.3	86.6 M	86.6	8.1		
Stream Flow (cfs)	9		1.8	10.6	3.5	5.0	3.2		
Chemical									
Dissolved Oxygen (mg/L)	9		7.6	10.0	8.5	8.8	1.0		
pH (su)	9		7.3	7.8	7.5	7.6	0.2		
Ammonia Nitrogen (mg/L)	8	<	0.015	1.357	0.008	0.178	0.477		
Nitrate+Nitrite Nitrogen (mg/L)	8		0.073	0.555	0.206	0.273	0.188		
Total Kjeldahl Nitrogen (mg/L)	8	<	0.150	1.645	0.075	0.284	0.551		
Total Nitrogen (mg/L)	8	<	0.148	2.200	0.311	0.557	0.680		
J Dissolved Reactive Phosphorus (mg/L)	8		0.004	0.060	0.012	0.016	0.018		
J Total Phosphorus (mg/L)	7		0.011	0.022	0.016	0.016	0.004		
CBOD-5 (mg/L)	8	<	1.0	3.3	0.5	0.8	1.0		
J Chlorides (mg/L)	8		26.3	69.9	36.9 M	39.5	13.5		
Atrazine (µg/L)	1					0.10			
Total Metals									
Aluminum (mg/L)	8	<	0.015	0.200	0.048	0.060	0.053		
Iron (mg/L)	8		0.098	0.220	0.111 M	0.143	0.054		
Manganese (mg/L)	8		0.123	1.300	0.545	0.547	0.403		
Dissolved Metals									
Aluminum (mg/L)	8	<	0.015	0.220	0.008	0.060	0.080		
J Antimony (µg/L)	8	<	1.6	6.0	1.0	1.8	1.8		
Arsenic (µg/L)	5	<	0.5	5.0	1.1 M	1.5	1.0		
Cadmium (mg/L)	8	<	0.000	<0.009	0.002	0.002	0.001		
Chromium (mg/L)	8	<	0.002	<0.01	0.002	0.003	0.001		
J Copper (mg/L)	8	<	0.002	<0.01	0.002	0.004	0.003		
J Iron (mg/L)	8	<	0.005	0.060	0.004	0.011	0.011		
J Lead (µg/L)	8	<	1.10	5.00	0.70 M	1.30	1.20		
J Manganese (mg/L)	8		0.092	1.050	0.520	0.494	0.343		
J Mercury (µg/L)	8	<	0.030	0.500	0.118 C	0.116	0.100	1	1
Nickel (mg/L)	8	<	0.006	0.024	0.003	0.005	0.004		
Selenium (µg/L)	8	<	1.6	5.0	0.8 M	1.2	0.8		
Silver (mg/L)	8	<	0.000	0.003	0.002	0.001	0.001		
Thallium (µg/L)	8	<	0.6	9.0	0.3	1.0	1.5		
Zinc (mg/L)	8	<	0.002	0.014	0.003	0.004	0.004		
Biological									
J Chlorophyll a (ug/L)	8	<	0.10	3.47	0.94	1.10	1.05		
J Fecal Coliform (col/100 mL)	8		9	64	16	30	25		

N=# samples; C=value exceeds established criteria for *F&W* water use classification; J=estimate; M=value > 90% of all verified ecoregional reference reach data collected in the subecoregion/ecoregion 68f; G=value greater than median concentration of all verified reference data collected in ecoregion 68f.

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