Alabama Department of Environmental Management

Basin Assessment Site

Rivers and Streams Monitoring Program

2007 Monitoring Summary

Fair

Blue Creek at Tuscaloosa County Road 47 (33.45083/-87.41222)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Blue Creek watershed for biological and water quality monitoring as part of the 2007 Black Warrior Cahaba (BWC) Basin Assessment Monitoring. Blue Creek at BLUT-1 was also selected as a candidate reference site because of the high percent forested area and low population density within the watershed. The objectives of the BWC Basin Assessments were to assess each monitoring location and to estimate overall water quality within the basin. Data from the project will be used for metric and criteria development.

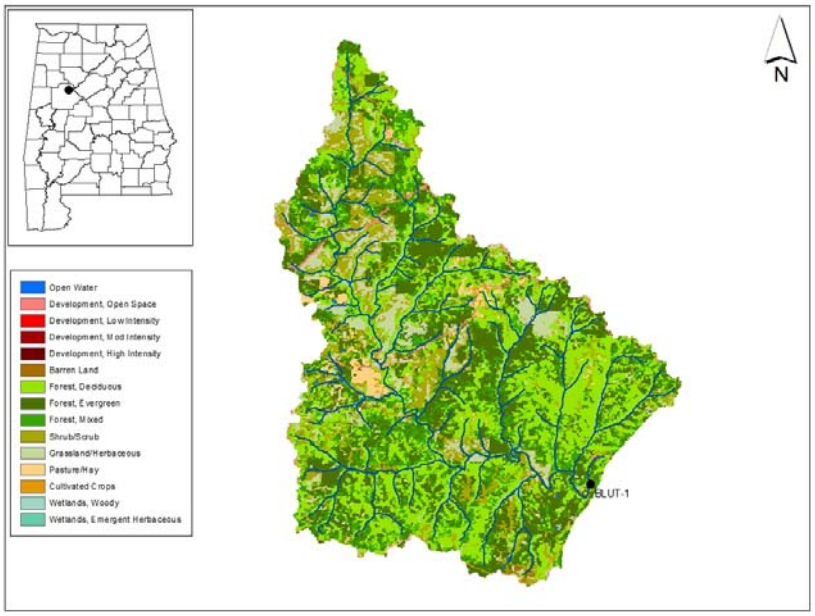

Figure 1. Watershed Characteristics of Blue Creek at BLUT-1.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Black Warrior River
Drainage Area (mi^2)		37
Ecoregion[a]		68f
% Landuse		
Open water		<1
Wetland	Woody	1
Forest	Deciduous	35
	Evergreen	28
	Mixed	14
Shrub/scrub		12
Grassland/herbaceous		8
Pasture/hay		2
Cultivated crops		<1
Development	Open space	1
	Low intensity	<1
Barren		<1
Population/km^2 [b]		2
# NPDES Permits[c]	**TOTAL**	3
Mining		2
Municipal Individual		1

a.Shale Hills

b.2000 US Census

c.#NPDES permits downloaded from ADEM's NPDES Management System database, Feb 23, 2011.

Table 2. Physical characteristics of Blue Creek at BLUT-1, May 9, 2007.

Physical Characteristics	
Width (ft)	40
Canopy Cover	Mostly Open
Depth (ft)	
Riffle	0.8
Run	1.5
Pool	2.5
% of Reach	
Riffle	15
Run	75
Pool	10
% Substrate	
Bedrock	56
Boulder	5
Cobble	5
Gravel	15
Sand	5
Silt	8
Organic Matter	6

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Blue Creek is a *Fish & Wildlife (F&W)* stream that drains thirty-seven square miles along the Shale Hills in Tuscaloosa County. Based on the 2000 National Land Cover Dataset, landuse within the watershed is primarily forest (77%) with some shrubs, and grassland (Figure 1). Population density is relatively very low. As of February 23, 2011, three mining and municipal 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. Blue Creek at BLUT -1 is a moderate gradient stream with a largely bedrock bottom which is typical of Shale Hills sub ecoregion (68f). Overall habitat quality was categorized as *optimal*.

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 scores for all individual metrics. Metric results indicated the macroinvertebrate community to be in *fair* condition (Table 4).

Table 3. Results of the habitat assessment conducted on Blue Creek at BLUT-1, May 9, 2007.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	63	Sub-optimal (59-70)
Sediment Deposition	74	Optimal >70
Sinuosity	85	Optimal >84
Bank and Vegetative Stability	79	Optimal >74
Riparian Buffer	90	Optimal >89
Habitat Assessment Score	**181**	
% Maximum Score	**75**	**Optimal >70**

Table 4. Results of the macroinvertebrate bioassessment conducted in Blue Creek at BLUT-1, May 9, 2007.

Macroinvertebrate Assessment			
	Results	**Scores (0-100)**	**Rating**
Taxa richness measures			
# Ephemeroptera (mayfly) genera	7	58	Fair (47-70)
# Plecoptera (stonefly) genera	3	50	Good (50-75)
# Trichoptera (caddisfly) genera	8	67	Good (67-83)
Taxonomic composition measures			
% Non-insect taxa	7	72	Fair (49.5-74.1)
% Non-insect organisms	10	75	Fair (62.8-93.9)
% Plecoptera	3	16	Fair (13.2-19.7)
Tolerance measures			
Beck's community tolerance index	14	50	Fair (41.0-60.9)
WMB-I Assessment Score	**--**	**55**	**Fair (49-72)**

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 anually (pesticides, atrazine, and semi-volatile organics) during March through October of 2007 to help identify any stressors to the biological communities. *In situ* parameters suggested Blue Creek at BLUT-1 was meeting the water quality criteria for its *F&W* use classification. Median concentrations of total dissolved solids, alkalinity, specific conductance, hardness, and chlorides were higher than background levels based on reference reach data collected in the ecoregion 68f. All metals were within the expected range or below detection limits. Atrazine was detected in the sample collected in September. Dissolved mercury exceeded the Aquatic Life Use (ALU) criterion in August, while dissolved thallium exceeded the Human Health (HH) criterion in March.

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 *fair* condition, although overall habitat quality was *optimal*. Concentrations of total dissolved solids, specific conductance, alkalinity, hardness and chlorides were elevated as compared to ADEM's least-impaired reference reaches in ecoregion 68f. Based on these results, Blue Creek at BLUT-1 is not suitable for reference reach for ecoregion 68f. Monitoring should continue to ensure that water quality and biological conditions remain stable.

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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). 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	Q	E
Physical								
Temperature (°C)	9	16.1	29.6	23.6	23.2	4.0		
Turbidity (NTU)	9	1.0	4.2	1.6	2.2	1.2		
Total Dissolved Solids (mg/L)	8	94.0	707.0	515.0 M	447.4	216.9		
Total Suspended Solids (mg/L)	8	0.5	16.0	2.5	4.8	5.2		
Specific Conductance (µmhos)	9	505.6	1,254.0	738.8 G	826.4	256.1		
Hardness (mg/L)	5	237.0	352.0	277.0 G	286.2	48.4		
Alkalinity (mg/L)	8	52.5	129.9	86.6 M	86.1	26.9		
Stream Flow (cfs)	7	0.3	9.8	2.4	3.7	3.2		
Chemical								
Dissolved Oxygen (mg/L)	9	6.9	9.1	8.5	8.3	0.6		
pH (su)	9	7.4	7.9	7.7	7.7	0.2		
Ammonia Nitrogen (mg/L)	8	< 0.015	< 0.015	0.008	0.008	0.000		
Nitrate+Nitrite Nitrogen (mg/L)	8	< 0.003	0.037	0.018	0.018	0.014	J	
Total Kjeldahl Nitrogen (mg/L)	8	< 0.150	0.244	0.154	0.146	0.066		
Total Nitrogen (mg/L)	8	< 0.076	0.278	0.180	0.163	0.071	J	
Dissolved Reactive Phosphorus (mg/L)	8	0.010	0.061	0.012	0.019	0.018		
Total Phosphorus (mg/L)	8	0.014	0.057	0.018	0.022	0.014	J	
CBOD-5 (mg/L)	8	< 1.0	4.3	0.5	1.0	1.3		
Chlorides (mg/L)	8	4.0	10.0	6.7 M	7.0	1.8	J	
Atrazine (µg/L)	1				0.06			
Total Metals								
Aluminum (mg/L)	6	< 0.015	0.160	0.050	0.070	0.058	J	
Iron (mg/L)	6	0.043	0.110	0.068	0.070	0.026	J	
Manganese (mg/L)	6	0.040	0.640	0.076	0.165	0.234	J	
Dissolved Metals								
Aluminum (mg/L)	6	< 0.015	0.210	0.008	0.065	0.091		
Antimony (µg/L)	6	< 1.6	5.0	1.0	1.2	0.6		
Arsenic (µg/L)	4	< 0.5	5.0	1.1	1.2	0.9		
Cadmium (mg/L)	6	< 0.000	0.005	0.002	0.002	0.001		
Chromium (mg/L)	6	< 0.003	0.010	0.002	0.003	0.001		
Copper (mg/L)	6	< 0.002	0.010	0.002	0.003	0.001		
Iron (mg/L)	6	< 0.005	0.060	0.002	0.013	0.017		
Lead (µg/L)	6	< 1.1	5.0	0.7	0.1	0.7		
Manganese (mg/L)	6	0.030	0.089	0.043	0.049	0.022	J	
Mercury (µg/L)	6	< 0.0	0.5 A	0.2	0.1	0.1	J	1
Nickel (mg/L)	6	< 0.005	0.010	0.003	0.004	0.001		
Selenium (µg/L)	6	< 1.6	5.0	0.8	1.1	0.7		
Silver (mg/L)	6	< 0.0	< 0.0	0.0	0.0	0.0	J	
Thallium (µg/L)	6	< 0.6	2.5 H	0.3	0.6	0.5	J	1
Zinc (mg/L)	6	< 0.002	2.500	0.003	0.210	0.509		
Biological								
Chlorophyll a (ug/L)	8	0.33	1.60	1.07	0.99	0.52	J	
Fecal Coliform (col/100 mL)	8	8	110	18	40	42	J	

E=# samples exceeded criteria; J=estimate; N=# samples; Q=qualifier; M=value > 90th percentile of all verified ecoregional reference reach data collected within ecoregion(68f); G=value > median of all ecoregional reference reach data collected in ecoregion (68f); A= (*F&W*) aquatic life use criterion exceeded; H= (*F&W*) human health criterion exceeded.