Alabama Department of Environmental Management

Basin Assessment Site

Rivers and Streams Monitoring Program

2009 Monitoring Summary

Bluewater Creek in Lauderdale County at US Hwy 72 (34.85779/-87.41572)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Bluewater Creek watershed for biological and water quality monitoring as part of the 2009 Tennessee (TN) River Basin Monitoring. The objectives of this project were to assess the biological integrity of each monitoring site and to estimate overall water quality within the Tennessee River basin.

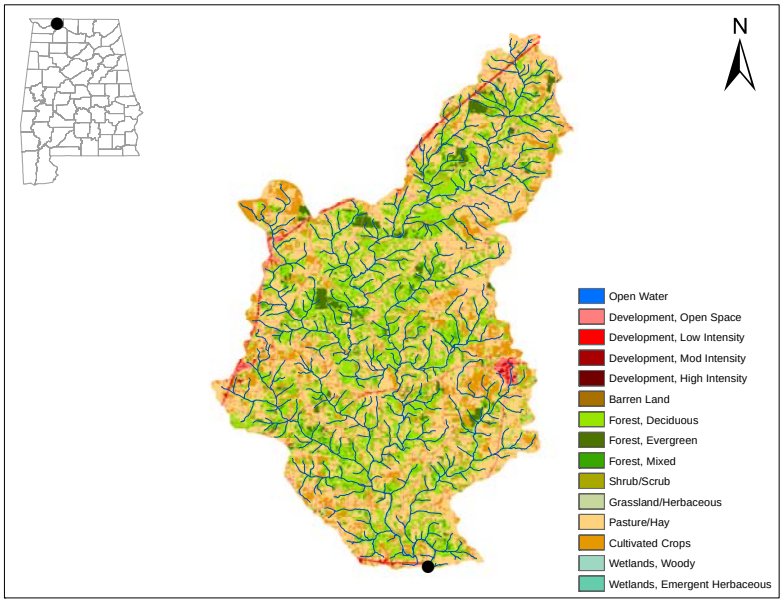

Figure 1. Sampling location and landuse within the Bluewater Creek watershed at BLWL-2.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Bluewater Creek is a large *Fish & Wildlife (F&W)* stream located in the Western Highland Rim ecoregion (71f). Based on the 2000 National Land Cover Dataset, landuse within the watershed is primarily composed of pasture with some deciduous forested areas (Figure 1). As of February 23, 2011, ADEM's NPDES Management System database shows a total of 29 permitted discharges within 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. Bluewater Creek at BLWL-2 is a low-gradient, glide-pool stream. The substrate in Bluewater Creek is composed of bedrock, boulder, cobble, and gravel. Overall habitat quality was categorized as *optimal* due to little sediment deposition and the presence of favorable habitats for aquatic macroinvertebrates.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Tennessee River
Drainage Area (mi^2)		129
Ecoregion[a]		71f
% Landuse		
Open water		<1
Wetland	Woody	1
	Emergent herbaceous	<1
Forest	Deciduous	28
	Evergreen	2
	Mixed	4
Shrub/scrub		5
Grassland/herbaceous		1
Pasture/hay		44
Cultivated crops		9
Development	Open space	6
	Low intensity	1
	Moderate intensity	<1
	High intensity	<1
Barren		<1
Population/km^2[b]		153
# NPDES Permits[c]	**TOTAL**	29
Construction Stormwater		24
Industrial General		1
Industrial Individual		2
Municipal Individual		2

a. Western Highland Rim
b. 2000 US Census
c. #NPDES permits downloaded from ADEM's NPDES Management System database, February 23, 2011

Table 2. Physical characteristics of Bluewater Creek at BLWL-2, July 1, 2009.

Physical Characteristics		
Width (ft)		100
Canopy Cover		Open
Depth (ft)		
	Run	3.0
	Pool	3.5
% of Reach		
	Run	60
	Pool	40
% Substrate		
	Bedrock	50
	Boulder	14
	Cobble	10
	Gravel	19
	Sand	5
	Organic Matter	2

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 in comparison to conditions expected in north Alabama streams and rivers. Each site is placed in one of six levels, ranging from 1, or *natural* to 6, or *highly altered*. The macroinvertebrate survey conducted at BLWL-2 rated the site as a 4$^-$, or *fair/poor*. Abundance of pollution-sensitive taxa are lower than expected, and pollution-tolerant taxa are dominating the community. (Table 4).

Table 3. Results of the habitat assessment conducted on Bluewater Creek at BLWL-2, July 1, 2009.

Habitat Assessment	% Maximum Score	Rating
Instream Habitat Quality	77	Optimal >70
Sediment Deposition	73	Optimal >70
Sinuosity	45	Marginal (45-64)
Bank and Vegetative Stability	70	Sub-optimal (60-74)
Riparian Buffer	80	Sub-optimal (70-89)
Habitat Assessment Score	**159**	
% Maximum Score	**72**	**Optimal >70**

Table 4. Results of the macroinvertebrate bioassessment conducted in Bluewater Creek at BLWL-2, July 1, 2009.

Macroinvertebrate Assessment	
	Results
Taxa richness and diversity measures	
Total # Taxa	52
# EPT taxa	14
Shannon Diversity	4.08
# Highly-sensitive and Specialized Taxa	1
Taxonomic composition measures	
% EPT minus Baetidae and Hydropsychidae	16
% Non-insect taxa	21
% Individuals in Dominant 5 Taxa	58
Functional feeding group	
% Predator Individuals	4
Community tolerance	
# Sensitive EPT	2
% Sensitive taxa	13
% Tolerant taxa	33
WMB-I Assessment Score	**4^{-}**
WMB-I Assessment Rating	**Fair/Poor**

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. Samples were collected monthly, semi-monthly (metals), or quarterly (pesticides, atrazine, and semi-volatile organics) during March through October of 2009.

Organics were collected at BLWL-2 on March 17th and July 8th. All parameters, with the exception of atrazine by immunoassay, were below detection limits. When atrazine was detected (July 8th), stream flow was 145.2 cfs. Median specific conductance values were higher than expected for ecoregion 71f. Median concentrations of chlorides and dissolved reactive phosphorus were higher than expected based on the 90th percentile of all reference reach data collected in the Western Highland Rim ecoregion. Estimated concentrations of dissolved iron also appear to be elevated. Nutrient samples collected March through July (with the exception of nitrate+nitrite nitrogen and dissolved reactive phosphorus) and all mercury samples were excluded from analysis because they did not meet ADEM's laboratory QC requirements.

SUMMARY

Bioassessment results indicated the macroinvertebrate community to be in *fair/poor* condition. However, overall habitat quality was categorized as *optimal* due to little sediment deposition and the presence of favorable habitats for aquatic macroinvertebrates. Monitoring should continue to ensure that water quality and biological conditions remain stable and to determine the cause of the *fair/poor* macroinvertebrate community condition.

Table 5. Summary of water quality data collected March-October, 2009. 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	Q
Physical							
Temperature (°C)	9	9.7	27.2	22.2	19.3	5.6	
Turbidity (NTU)	9	2.9	10.4	4.8	5.1	2.4	
Total Dissolved Solids (mg/L)	8	58.0	82.0	71.5	70.6	8.6	
J Total Suspended Solids (mg/L)	8	3.0	10.0	4.5	5.5	2.6	
Specific Conductance (µmhos)	9	87.0	144.0	119.0 G	113.5	19.3	
Hardness (mg/L)	4	32.1	63.9	41.6	44.8	14.4	
Alkalinity (mg/L)	8	21.6	61.9	39.5	42.4	12.9	
Stream Flow (cfs)	6	32.8	186.4	101.4	100.6	67.4	
Chemical							
Dissolved Oxygen (mg/L)	9	7.1	11.8	8.7	8.8	1.6	
pH (su)	9	7.1	8.4	7.9	7.8	0.4	
B Ammonia Nitrogen (mg/L)	3	< 0.006	< 0.006	0.003	0.003	0.000	
BJ Nitrate+Nitrite Nitrogen (mg/L)	6	0.063	3.654	0.592	1.263	1.413	
B Total Kjeldahl Nitrogen (mg/L)	3	< 0.089	0.412	0.044	0.167	0.212	
B Total Nitrogen (mg/L)	3	< 0.410	1.123	0.518	0.684	0.384	
J Dissolved Reactive Phosphorus (mg/L)	8	0.021	0.095	0.042 M	0.050	0.028	
Total Phosphorus (mg/L)	3	0.017	0.038	0.027	0.027	0.010	
CBOD-5 (mg/L)	8	< 1.0	< 1.0	0.5	0.5	0.0	
Chlorides (mg/L)	8	1.6	8.8	4.5 M	4.7	2.7	
Atrazine (µg/L)	2	< 0.06	0.18	0.10	0.10	0.11	
Total Metals							
J Aluminum (mg/L)	4	< 0.060	0.130	0.074	0.077	0.041	
J Iron (mg/L)	4	0.079	0.149	0.084	0.099	0.033	
J Manganese (mg/L)	4	0.014	0.069	0.025	0.033	0.024	
Dissolved Metals							
J Aluminum (mg/L)	4	< 0.058	0.060	0.030	0.037	0.014	
Antimony (µg/L)	4	< 6.0	< 6.0	3.0	3.0	0.0	
J Arsenic (µg/L)	4	< 0.4	0.7 H	0.2	0.3	0.3	1
Cadmium (mg/L)	4	< 0.000	< 0.002	0.001	0.001	0.000	
Chromium (mg/L)	4	< 0.007	< 0.007	0.004	0.004	0.000	
Copper (mg/L)	4	< 0.200	< 0.200	0.100	0.100	0.000	
J Iron (mg/L)	4	< 0.020	0.087	0.034 M	0.042	0.034	
Lead (µg/L)	4	< 0.5	< 1.5	0.8	0.6	0.2	
J Manganese (mg/L)	4	< 0.009	0.013	0.008	0.008	0.005	
B Mercury (µg/L)	0						
Nickel (mg/L)	4	< 0.008	< 0.008	0.004	0.004	0.000	
Selenium (µg/L)	4	< 0.4	< 0.4	0.2	0.2	0.0	
Silver (mg/L)	4	< 0.001	< 0.001	0.000	0.000	0.000	
Thallium (µg/L)	4	< 0.4	< 0.4	0.2	0.2	0.0	
Zinc (mg/L)	4	< 0.060	< 0.060	0.030	0.030	0.000	
Biological							
Chlorophyll a (ug/L)	8	< 1.00	1.07	0.50	0.57	0.20	
J Fecal Coliform (col/100 mL)	7	22	210	64	90	73	
J E. coli (col/100mL)	2	78	517	298	298	310	

B=samples excluded due to laboratory QC concerns; Q=# samples with uncertain exceedances; G=value higher than median concentration of all verified ecoregional reference reach data collected in the ecoregion 71f; H=*F&W* human health criteria exceeded; J=estimate; M=value >90% of all verified ecoregional reference reach data collected in the ecoregion 71f; N=# samples.

FOR MORE INFORMATION, CONTACT:
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