Alabama Department of Environmental Management

Trends Monitoring Site

Rivers and Streams Monitoring Program

2012 Monitoring Summary

TM

Poor

Buck Creek below dam off Hwy 261 (Shelby County) (33.29694/-86.84263)

BACKGROUND

Buck Creek was selected 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 project were to assess the biological integrity of each monitoring site and to estimate overall water quality within the BWC basin.

Figure 1. Buck Creek at B-1, May 1, 2012.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Buck Creek at B-1 is a *Fish & Wildlife (F&W)* stream located in the Southern Limestone/ Dolomite Valleys and Low Rolling Hills sub-ecoregion (67f) of the Ridge and Valley ecoregion (67) in Shelby County (Figure 1). Based on the 2006 National Land Cover Dataset, land cover within the watershed is approximately 52% forested. As of September 1, 2012, ADEM's NPDES Management System database shows 342 permitted discharges located within the watershed, the majority of which are construction stormwater permits.

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. Buck Creek at B-1 is a high-gradient, riffle-run stream characterized by gravel and cobble substrates. Overall habitat quality was categorized as *sub-optimal* for supporting macroinvertebrate communities (Table 3). Sinuosity and riparian buffer were issues within the reach.

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 all individual metric scores. The low taxa richness of pollution intolerant organisms indicated the macroinvertebrate community in Buck Creek to be in *poor* condition (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Cahaba River
Drainage Area (mi^2)		71
Ecoregion[a]		67f
% Landuse		
Open water		<1
Wetland	Woody	<1
Forest	Deciduous	42
	Evergreen	6
	Mixed	4
Shrub/scrub		2
Grassland/herbaceous		3
Pasture/hay		5
Cultivated crops		1
Development	Open space	15
	Low intensity	13
	Moderate intensity	4
	High intensity	1
Barren		2
Population/km^2[2b]		279
# NPDES Permits[c]	**TOTAL**	342
401 Water Quality Certification		3
Construction Stormwater		292
Mining		8
Industrial General		23
Industrial Individual		1
Municipal Individual		14
Underground Injection Control		1

a. Southern Limestone/Dolomite Valleys and Low Rolling Hills

b. 2000 US Census

c. #NPDES permits downloaded from ADEM's NPDES Management System database, September 1, 2012.

Table 2. Physical characteristics of Buck Creek at B-1, April 25, 2012.

Physical Characteristics		
Width (ft)		55
Canopy Cover		Mostly Open
Depth (ft)		
	Riffle	0.8
	Run	1.0
	Pool	1.0
% of Reach		
	Riffle	80
	Run	15
	Pool	5
% Substrate		
	Cobble	30
	Gravel	50
	Sand	13
	Organic Matter	7

Table 3. Results of the habitat assessment conducted on Buck Creek at B-1, April 25, 2012.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	77	Optimal (>70)
Sediment Deposition	66	Sub-optimal (59-70)
Sinuosity	35	Poor (<45)
Bank and Vegetative Stability	75	Optimal (>74)
Riparian Buffer	55	Marginal (50-69)
Habitat Assessment Score	**160**	
% Maximum Score	**66**	**Sub-optimal (59-70)**

Table 4. Results of the macroinvertebrate bioassessment conducted in Buck Creek at B-1, April 25, 2012.

Macroinvertebrate Assessment		
	Results	**Scores**
Taxa richness and diversity measures		**(0-100)**
# EPT taxa	11	30
Shannon Diversity	3.81	52
Taxonomic composition measures		
% EPT minus Baetidae and Hydropsychidae	8	17
% Non-insect taxa	13	50
Tolerance measures		
% Tolerant taxa	27	63
WMB-I Assessment Score	**---**	**42.3**
WMB-I Assessment Rating		**Poor (23-46)**

WATER CHEMISTRY

Results of water chemistry are presented in Table 5. In situ measurements and water samples were collected monthly or semi-monthly (metals) January through December of 2012 to help identify any stressors to the biological communities.

Total dissolved solids, specific conductance, hardness, nitrate+nitrite nitrogen, total nitrogen, dissolved reactive phosphorus, total phosphorus, chlorides, and dissolved copper were at levels higher than expected based on data collected at reference reaches within the Southern Limestone/Dolomite Valleys and Low Rolling Hills ecoregion (67f). Concentrations of dissolved arsenic exceeded the standard human health criterion on June 5, 2012 and October 2, 2012; however, concentrations were normal for ecoregion 67f. Although samples of total dissolved arsenic did exceed human health criteria at B-1, ADEM criteria for arsenic are expressed as dissolved trivalent arsenic (arsenite – As III). Presently studies are being conducted in order to provide a better understanding of the prevalence and areal distribution of dissolved trivalent arsenic to total arsenic in the State of Alabama. Upon conclusion of the studies Buck Creek will be reassessed for arsenic violations.

SUMMARY

Bioassessment results show the macroinvertebrate community to be in *poor* condition. Overall habitat quality was categorized as *sub-optimal* due to poor sinuosity and marginal riparian buffers. As part of assessment process, ADEM will review the monitoring information presented in this report along with all other available data.

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Table 5. Summary of water quality data collected January-December 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) were calculated by multiplying the MDL by 0.5 when results were less than this value.

Parameter	N	Min	Max	Med	Avg	SD	E
Physical							
Temperature (°C)	13	13.0	26.4	18.2	19.3	4.6	
Turbidity (NTU)	13	2.3	67.3 T	6.6	12.4	18.0	
J Total Dissolved Solids (mg/L)	12	124.0	246.0	199.5 M	195.6	38.7	
J Total Suspended Solids (mg/L)	12	< 1.0	44.0	6.0	9.5	11.6	
Specific Conductance (µmhos)	13	170.0	431.0	341.0 G	319.0	78.1	
Hardness (mg/L)	4	128.0	179.0	154.0 G	153.8	21.6	
Alkalinity (mg/L)	12	38.6	127.0	105.7	98.0	28.1	
Stream Flow (cfs)	11	26.0	183.5	42.6	71.9	55.7	
Chemical							
Dissolved Oxygen (mg/L)	13	8.0	11.4	9.0	9.5	1.2	
pH (su)	13	7.5	8.1	7.9	7.9	0.2	
J Ammonia Nitrogen (mg/L)	12	< 0.010	0.105	0.014	0.023	0.030	
J Nitrate+Nitrite Nitrogen (mg/L)	12	0.705	7.600	2.945 M	2.985	1.991	
Total Kjeldahl Nitrogen (mg/L)	12	0.214	0.588	0.334	0.378	0.133	
J Total Nitrogen (mg/L)	12	0.938	8.083	3.197 M	3.363	2.022	
J Dissolved Reactive Phosphorus (mg/L)	11	0.005	0.414	0.070 M	0.104	0.114	
J Total Phosphorus (mg/L)	12	0.020	0.450	0.081 M	0.135	0.124	
J CBOD-5 (mg/L)	12	< 1.0	2.0	1.0	0.9	0.4	
J Chlorides (mg/L)	11	4.8	25.3	8.6 M	10.6	6.2	
Total Metals							
J Aluminum (mg/L)	4	0.073	0.114	0.088	0.091	0.018	
J Iron (mg/L)	4	0.169	0.236	0.178	0.190	0.031	
J Manganese (mg/L)	4	0.024	0.046	0.030	0.032	0.010	
Dissolved Metals							
J Aluminum (mg/L)	4	< 0.030	< 0.030	0.015	0.015	0.000	
Antimony (µg/L)	4	< 0.8	< 0.8	0.4	0.4	0.0	
J Arsenic (µg/L)	4	< 1.0	2.0 H	1.0	1.1	0.8	2
J Cadmium (µg/L)	4	< 0.090	< 0.090	0.045	0.045	0.000	
Chromium (mg/L)	4	< 0.005	< 0.005	0.002	0.002	0.000	
Copper (mg/L)	4	< 0.100	< 0.300	0.150 M	0.125	0.050	
J Iron (mg/L)	4	< 0.100	< 0.100	0.050	0.050	0.000	
J Lead (µg/L)	4	< 1.6	2.4	0.8	1.2	0.8	
J Manganese (mg/L)	4	0.010	0.019	0.018	0.016	0.004	
Nickel (mg/L)	4	< 0.010	< 0.010	0.005	0.005	0.000	
Selenium (µg/L)	4	< 2.0	< 2.0	1.0	1.0	0.0	
J Silver (µg/L)	4	< 1.000	< 1.000	0.500	0.500	0.000	
Thallium (µg/L)	4	< 0.4	< 0.4	0.2	0.2	0.0	
J Zinc (mg/L)	4	< 0.020	< 0.020	0.010	0.010	0.000	
Biological							
J Chlorophyll a (ug/L)	12	< 1.00	7.48	0.78	1.41	1.97	
E. coli (col/100mL)	12	78	> 2420	399	862	923	

E= # samples that exceeded criteria; G= value higher than median concentration of all verified ecoregional reference reach data collected in ecoregion 67f; H= F&W human health criterion exceeded; J= estimate; N=# samples; M=value >90% of all verified ecological reference reach data collected in the ecoregion/subecoregion 67f; T=value exceeds 50 NTU above the 90th percentile of all verified ecoregional reference reach data collected in the ecoregion 67f.