

2007 Monitoring Summary



Bear Creek at Oregonia Road crossing (Tuscaloosa County) (33.54245/-87.56167)

BACKGROUND

Bear Creek is one of the streams the Alabama Department of Environmental Management (ADEM) monitors as a “best attainable condition” reference watershed for larger riffle-run streams throughout the state. The data collected will be used for comparison with other streams in the Shale Hills ecoregion (68f).

Additionally, ADEM included the Bear Creek watershed for biological and water quality monitoring as part of the 2007 Assessment of the Black Warrior and Cahaba (BWC) River Basins. 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 BWC basin group.



Figure 1. Reach characteristics of Bear Creek at BERT-4, May 9, 2011.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Bear Creek is a *Fish & Wildlife (F&W)* tributary of North River located in north Tuscaloosa County. Based on the 2000 National Land Cover Dataset, land cover within the watershed is approximately 73% forested with some grassland/herbaceous and shrub/scrub. Population density is very low. Coalbed methane wells are common throughout the watershed. As of February 23, 2011, three NPDES permits have been issued 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. Bear Creek at BERT-4 is a high-gradient stream characterized by mostly bedrock and cobble bottom substrates (Figure 1). Overall habitat quality was categorized as *sub-optimal* as a result of marginal in-stream habitat quality and a channelized stream reach.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin	Black Warrior River	
Drainage Area (mi²)	15	
Ecoregion^a	68f	
% Landuse		
Open water		<1
Wetland	Woody	2
Forest	Deciduous	26
	Evergreen	35
	Mixed	12
Shrub/scrub		11
Grassland/herbaceous		12
Pasture/hay		<1
Cultivated crops		<1
Development	Open space	2
Barren		1
Population/km^{2b}		1
# NPDES Permits^c	TOTAL	3
Construction Stormwater		3

a. Shale Hills

b. 2000 US Census

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

Table 2. Physical characteristics of Bear Creek at BERT-4, May 9, 2007.

Physical Characteristics		
Width (ft)	15	
Canopy cover	Mostly Shaded	
Depth (ft)		
	Riffle	0.4
	Run	1.0
	Pool	1.5
% of Reach		
	Riffle	2
	Run	63
	Pool	35
% Substrate		
	Bedrock	65
	Boulder	5
	Cobble	15
	Gravel	5
	Silt	7
	Organic Matter	3

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 scores. Metric results indicated the macroinvertebrate community in Bear Creek at BERT-4 to be in *fair* condition (Table 4).

Table 3. Results of the habitat assessment conducted in Bear Creek at BERT-4, May 9, 2007.

Habitat Assessment	(% Maximum Score)	Rating
Instream Habitat Quality	53	Marginal (41-58)
Sediment Deposition	73	Optimal > 70
Sinuosity	43	Poor <45
Bank and Vegetative Stability	80	Optimal ≥74
Riparian Buffer	85	Sub-optimal (70-89)
Habitat Assessment Score	160	
% Maximum score	67	Sub-optimal (59-70)

Table 4. Results of the macroinvertebrate bioassessment conducted in Bear Creek at BERT-4, May 9, 2007.

Macroinvertebrate Assessment Results			
	Results	Scores	Rating
Taxa richness measures		(0-100)	
# Ephemeroptera (mayfly) genera	6	50	Fair (47-70)
# Plecoptera (stonefly) genera	4	67	Good (50-75)
# Trichoptera (caddisfly) genera	4	33	Poor (22-44)
Taxonomic composition measures			
% Non-insect taxa	13	47	Poor (24.7-49.4)
% Non-insect organisms	1	97	Excellent (>97)
% Plecoptera	4	21	Good (19.8-59.8)
Tolerance measures			
Beck's community tolerance index	14	50	Fair (41.0-60.9)
WMB-I Assessment Score	---	52	Fair (49-72)

WATER CHEMISTRY

Results of water chemistry are presented in Table 5. In situ measurements and water samples were scheduled to be collected monthly during March through October of 2007 to help identify any stressors to the biological communities. However, samples were only collected March through May due to intermittent flow conditions during the remaining sampling months.

Median concentrations of total dissolved solids and chlorides were above the 90th percentile of reference reach data collected in the Southwestern Appalachians ecoregion (68). Additionally, the median value of specific conductivity was above the median value of reference reach data collected in this ecoregion.

SUMMARY

Bioassessment results indicated the macroinvertebrate community in Bear Creek at BERT-4 to be in *fair* condition. Concentrations of total suspended solids, chlorides, and specific conductance were elevated as compared to ADEM's least-impaired reference reaches in the Southwestern Appalachians ecoregion. However, Bear Creek was impacted by severe drought during the sampling season in 2007, which may also have impacted the macroinvertebrate community. Monitoring should continue at the site to evaluate conditions under more normal flow conditions.

Table 5. Summary of water quality data collected March-October, 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	Median	Avg	SD
Physical						
Temperature (°C)	4	17.2	22.7	20.0	20.0	2.2
Turbidity (NTU)	6	0.0	8.3	4.4	4.2	3.7
Total Dissolved Solids (mg/L)	2	57.0	586.0	321.5 ^M	321.5	374.1
Total Suspended Solids (mg/L)	3	7.0	16.0	9.0	10.7	4.7
Specific Conductance (µmhos)	4	57.5	935.4	125.6 ^G	311.0	418.0
Alkalinity (mg/L)	3	5.9	16.3	9.6	10.6	5.3
Stream Flow (cfs)	3	0.4	3.0	1.1	1.5	1.3
Chemical						
Dissolved Oxygen (mg/L)	4	7.4	8.9	8.2	8.3	0.5
pH (su)	4	6.4	7.6	6.7	6.8	0.5
Ammonia Nitrogen (mg/L)	3	< 0.015	< 0.015	0.008	0.008	0.000
Nitrate+Nitrite Nitrogen (mg/L)	3	< 0.003	0.046	0.009	0.019	0.024
Total Kjeldahl Nitrogen (mg/L)	3	< 0.150	< 0.150	0.075	0.075	0.000
Total Nitrogen (mg/L)	3	< 0.076	< 0.121	0.084	0.094	0.024
Dissolved Reactive Phosphorus (mg/L)	3	0.011	0.068	0.013	0.031	0.032
^J Total Phosphorus (mg/L)	3	0.019	0.060	0.022	0.034	0.023
CBOD-5 (mg/L)	3	< 1.0	< 1.0	0.5	0.7	0.3
COD (mg/L)	3	< 2.0	< 2.0	1.0	1.0	0.0
^J TOC (mg/L)	3	1.2	1.9	1.7	1.59	0.4
^J Chlorides (mg/L)	3	6.8	254.3	34.9 ^M	98.6	135.5
Biological						
^J Chlorophyll a (µg/L)	3	1.60	2.67	2.14	2.14	0.54
^J Fecal Coliform (col/100 mL)	3	7	70	20	32	33

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

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