

2010 Monitoring Summary



Basin Assessment Site

Shoal Creek at Alexander Road in Shelby County. (33.50511/-86.50942)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Shoal Creek watershed for biological and water quality monitoring as part of the 2010 Alabama-Coosa-Tallapoosa (ACT) 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 ACT River Basin.



Figure 1. Sampling location on Shoal Creek at SHLS-1, May 27, 2010.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Shoal Creek is a *Fish & Wildlife (F&W)* stream located in north Shelby County. Based on the 2006 National Land Cover Dataset, landuse with the watershed is primarily forest (79%), with some pasture land. As of September 4, 2012, ADEM's NPDES Management System database shows a total of 20 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 conditions of the site and the quality and availability of habitat. Substrate within the reach is dominated by sand, silt and gravel (Figure 1). Due to streambank instability and a lack of instream habitat diversity, the overall habitat quality was categorized as *marginal* for supporting aquatic communities.

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. Metric results indicated the macroinvertebrate community to be characterized by pollution-tolerant taxa groups, indicating *poor* community condition (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Coosa R
Drainage Area (mi ²)		16
Ecoregion ^a		67h
% Landuse		
Open water		<1
Wetland	Woody	1
	Emergent herbaceous	<1
Forest	Deciduous	60
	Evergreen	12
	Mixed	7
Shrub/scrub		1
Grassland/herbaceous		2
Pasture/hay		6
Cultivated crops		1
Development	Open space	6
	Low intensity	<1
	Moderate intensity	<1
Barren		<1
Population/km ^{2b}		68
# NPDES Permits ^c	TOTAL	20
	Construction Stormwater	18
	Municipal Individual	2

a. Southern Sandstone Ridges

b. 2000 US Census

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

Table 2. Physical characteristics of Shoal Creek at SHLS-1, May 20, 2010.

Physical Characteristics	
Width (ft)	25
Canopy Cover	Shaded
Depth (ft)	
	Run 1.5
	Pool 1.8
% of Reach	
	Run 90
	Pool 10
% Substrate	
	Clay 5
	Mud/Muck 7
	Gravel 10
	Sand 50
	Silt 15
	Organic Matter 13

Table 3. Results of the habitat assessment conducted on Shoal Creek at SHLS-1, May 20, 2010.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	43	Marginal (41-58)
Sediment Deposition	49	Marginal (41-58)
Sinuosity	33	Poor <45
Bank and Vegetative Stability	35	Marginal (35-59)
Riparian Buffer	68	Marginal (50-69)
Habitat Assessment Score	106	
% Maximum Score	48	Marginal (41-58)

Table 4. Results of the macroinvertebrate bioassessment conducted in Shoal Creek at SHLS-1 on May 20, 2010.

Macroinvertebrate Assessment		
	Results	Scores
Taxa richness and diversity measures		(0-100)
# EPT taxa	9	22
Shannon Diversity	2.69	0
Taxonomic composition measures		
% EPT minus Baetidae and Hydropsychidae	12	12
% Non-insect taxa	9	67
Tolerance measures		
% Tolerant taxa	30	54
WMB-I Assessment Score	---	31
WMB-I Assessment Rating		Poor (23-46)

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. Samples were collected May, July, September, and November of 2010. Dissolved oxygen did not meet the *F&W* criterion in July or September. However, stream flow was only 1.1 cfs in July and too low to be measured in September. During a low flow period in November, stream pH did not meet the *F&W* criterion. During September and November, arsenic and mercury concentrations exceeded Human Health criteria. Manganese, copper, and iron were higher than the 90th percentile of reference reach data collected in the Southern Sandstone Ridges ecoregion. Pesticide and semi-volatile samples collected in May and November were below detection limits.

SUMMARY

Bioassessment results indicated the macroinvertebrate community to be in *poor* condition. Biological conditions may have been affected by lower than normal stream flows. Overall habitat quality was categorized as *marginal* due to limited availability of stable substrate and instream cover. Water chemistry results indicated elevated metals concentrations. Additional monitoring is recommended to determine if exceedances were due to natural conditions or anthropogenic sources.

Table 5. Summary of water quality data collected April-November, 2010. 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	E
Physical							
Temperature (°C)	5	14.7	27.3	23.1	21.5	4.8	
Turbidity (NTU)	5	7.1	11.2	8.3	8.6	1.6	
Total Dissolved Solids (mg/L)	4	52.0	71.0	62.0	61.8	7.8	
Total Suspended Solids (mg/L)	4	4.0	13.0	5.0	6.8	4.2	
Specific Conductance (µmhos)	5	56.5	97.0	75 ^G	75.1	18.1	
Hardness (mg/L)	4	22.6	34.2	30.7 ^G	29.6	5.6	
Alkalinity (mg/L)	4	6.8	38.3	23.5 ^M	23.0	16.1	
Stream Flow (cfs)	4	0.4	10.0	4.2	4.7	4.7	
Chemical							
Dissolved Oxygen (mg/L)	5	3.8 ^C	7.6	5.4	5.7	1.7	2
pH (su)	5	5.7 ^C	7.0	6.6	6.5	0.5	1
^J Nitrate+Nitrite Nitrogen (mg/L)	4	< 0.007	0.084	0.031	0.037	0.035	
^J Dissolved Reactive Phosphorus (mg/L)	4	< 0.003	0.005	0.002	0.002	0.002	
CBOD-5 (mg/L)	4	< 1.0	1.0	0.5	0.5	0.0	
Chlorides (mg/L)	4	2.5	19.4	9.6	10.3	7.7	
^J Atrazine (µg/L)	1				0.27		
Total Metals							
^J Aluminum (mg/L)	4	0.116	0.203	0.184	0.172	0.038	
Iron (mg/L)	4	0.609	1.530	1.295	1.182	0.426	
Manganese (mg/L)	4	0.084	0.707	0.504	0.450	0.278	
Dissolved Metals							
Aluminum (mg/L)	4	< 0.020	0.020	0.010	0.010	0.000	
Antimony (µg/L)	4	< 0.5	0.5	0.2	0.2	0.0	
^J Arsenic (µg/L)	4	< 1.0	2.2	1.2	1.2	0.9	2
Cadmium (µg/L)	4	< 0.400	0.400	0.200	0.200	0.000	
Chromium (mg/L)	4	< 0.002	0.002	0.001	0.001	0.000	
Copper (mg/L)	4	< 0.200	0.200	0.100	0.100	0.000	
Iron (mg/L)	4	0.193	0.616	0.501	0.453	0.193	
^J Lead (µg/L)	4	< 2.0	2.0	1.0	1.0	0.0	
Manganese (mg/L)	4	0.071	0.621	0.428	0.387	0.246	
^J BMercury (µg/L)	3	< 0.200	0.419	0.349	0.289	0.168	2
Nickel (mg/L)	4	< 0.005	0.005	0.002	0.002	0.000	
Selenium (µg/L)	4	< 1.2	1.2	0.6	0.6	0.0	
Silver (µg/L)	4	< 1.000	1.000	0.500	0.500	0.000	
Thallium (µg/L)	4	< 0.7	0.7	0.4	0.4	0.0	
Zinc (mg/L)	4	< 0.030	0.030	0.015	0.015	0.000	
Biological							
Chlorophyll a (ug/L)	4	< 1.00	2.67	1.87	1.73	1.11	
E. coli (col/100mL)	4	17	291	61	107	125	

A=*F&W* aquatic life use criterion exceeded; B=samples excluded due to laboratory QC concerns;; C=*F&W* criterion violated ; E=# samples that exceeded criteria; G=value above median of data in ecoregion; H=*F&W* human health criteria exceeded; J=estimate; M=value >90% of all verified ecoregional reference reach data collected in the ecoregion 67h; N=# samples.

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