

2010 Monitoring Summary



Shoal Creek at Alabama Highway 48 in Randolph County (33.44027/-85.36044)

BACKGROUND

Shoal Creek at SHLR-5 was selected as a site for nutrient criteria development in the Tallapoosa River Basin in 2010. Data collected will be used to develop and implement nutrient criteria in wadeable, flowing streams in the Tallapoosa River Basin, as well as statewide.



Figure 1. Shoal Creek at SHLR-5, June 3, 2010.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Shoal Creek at SHLR-5 is a *Fish & Wildlife (F&W)* stream located in Randolph County. Based on the 20006 National Land Cover Dataset, landuse in the watershed is primarily forest (54%) and pasture/hay. Population density in the area is low, and less than 8% of the watershed is developed. As of September 1, 2012, ADEM has issued one NPDES permits 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. Shoal Creek is a riffle-run stream with a benthic substrate that consists primarily of sand and gravel (Figure 1). Overall habitat quality was within the *sub-optimal* range for supporting macroinvertebrate communities, although unstable banks were noted 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 in comparison to least-impaired reference reaches in the same ecoregion. The final score is the average of all individual metric scores. Metric results indicated that the biological community at SHLR-5 was in *fair* condition (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Tallapoosa River
Drainage Area (mi ²)		19
Ecoregion ^a		45a
% Landuse		
Open water		<1
Wetland	Woody	<1
Forest	Deciduous	31
	Evergreen	22
	Mixed	1
Shrub/scrub		2
Grassland/herbaceous		4
Pasture/hay		35
Development	Open space	4
	Low intensity	2
	Moderate intensity	<1
	High intensity	<1
Barren		1
Population/km ^{2b}		13
# NPDES Permits ^c	TOTAL	1
Construction Stormwater		1

a.Southern Inner Piedmont

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 SHLR-5, May 19, 2010.

Physical Characteristics		
Width (ft)		25
Canopy cover		Mostly Open
Depth (ft)	Riffle	0.5
	Run	1.0
	Pool	2.5
% of Reach	Riffle	10
	Run	85
	Pool	5
% Substrate	Boulder	2
	Cobble	15
	Gravel	25
	Sand	45
	Silt	10
	Organic Matter	3

Table 3. Results of the habitat assessment conducted in Shoal Creek at SHLR-5, May 19, 2010.

Habitat Assessment	% Maximum Score	Rating
Instream Habitat Quality	69	Sub-optimal (59-70)
Sediment Deposition	63	Sub-optimal (59-70)
Sinuosity	70	Sub-optimal (65-84)
Bank and Vegetative Stability	36	Marginal (35-59)
Riparian Buffer	70	Sub-optimal (70-89)
Habitat Assessment Score	146	
% Maximum score	61	Sub-optimal (59-70)

Table 4. Results of the macroinvertebrate bioassessment conducted in Shoal Creek at SHLR-5, May 19, 2010.

Macroinvertebrate Assessment		
	Results	Scores (0-100)
Taxa richness and diversity measures		
# EPT taxa	24	87
Shannon Diversity	3.45	35
Taxonomic composition measures		
% EPT minus Baetidae and Hydropsychidae	10	9
% Non-insect taxa	1	100
Tolerance measures		
% Tolerant taxa	15	100
WMB-I Assessment Score	---	66
WMB-I Assessment Rating		Fair (47-69)

WATER CHEMISTRY

Results of water chemistry are presented in Table 5. In situ measurements and water samples were collected March through October of 2010 to help identify any stressors to the biological communities. On October 27th, turbidity was 999 NTU and stream pH was below the *F&W* use class criterion. High stream flow conditions caused by a large rain event at the time of sampling may be the cause of these exceedances. Median concentrations of ammonium nitrogen, nitrate+nitrite nitrogen, and total nitrogen were above the 90th percentile of data collected from reference reach streams in the Southern Inner Piedmont ecoregion (45a).

SUMMARY

Bioassessment results indicated the macroinvertebrate community at SHLR-5 to be in *fair* condition. However, concentrations of ammonium nitrogen, nitrate+nitrite nitrogen, and total nitrogen were elevated as compared to data from other reference reaches in ecoregion 45a. Also, pH was below *F&W* use criteria, and turbidity was above ecoregional guidelines, during one sampling event. Monitoring should continue to ensure that water quality and biological conditions remain stable.

Table 5. Summary of water quality data collected March-October, 2010. 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	E
Physical							
Temperature (°C)	9	13.1	27.4	20.2	21.0	4.2	
Turbidity (NTU)	9	3.4	999.0 ^T	5.5	117.3	330.6	
^J Total Dissolved Solids (mg/L)	8	20.0	100.0	33.0	39.8	25.3	
Total Suspended Solids (mg/L)	8	< 1.0	1710.0	2.0	216.6	603.4	
Specific Conductance (µmhos)	9	33.5	42.3	36.3	37.2	3.2	
Alkalinity (mg/L)	8	3.8	9.7	7.2	6.7	2.0	
Stream Flow (cfs)	6	2.5	40.9	11.2	15.4	13.6	
Chemical							
Dissolved Oxygen (mg/L)	9	6.6	10.1	7.9	8.3	1.1	
pH (su)	9	5.6 ^C	7.0	6.8	6.6	0.4	1
Ammonia Nitrogen (mg/L)	8	< 0.021	0.184	0.010 ^M	0.032	0.061	
^J Nitrate+Nitrite Nitrogen (mg/L)	8	0.269	0.629	0.458 ^M	0.446	0.127	
Total Kjeldahl Nitrogen (mg/L)	8	< 0.080	0.841	0.190	0.279	0.270	
^J Total Nitrogen (mg/L)	8	< 0.330	1.239	0.744 ^M	0.725	0.261	
^J Dissolved Reactive Phosphorus (mg/L)	8	0.004	0.019	0.010	0.010	0.005	
Total Phosphorus (mg/L)	8	0.013	0.502	0.019	0.080	0.170	
CBOD-5 (mg/L)	8	< 2.0	4.6	1.0	1.7	1.4	
Chlorides (mg/L)	8	2.5	3.7	3.3	3.2	0.4	
Biological							
Chlorophyll a (µg/L)	8	< 0.10	5.34	1.07	1.53	1.66	

C=*F&W* criterion violated; E=# samples that exceed criterion; J=estimate; M=value >90% of all verified ecoregional reference reach data collected in the ecoregion 45a; N=# samples; T=value exceeds 50 NTU above the 90th percentile of all verified ecoregional reference reach data collected in the ecoregion 45a.

FOR MORE INFORMATION, CONTACT:
 Ruthie Young, ADEM Aquatic Assessment Unit
 1350 Coliseum Boulevard Montgomery, AL 36110
 (334) 260-2762 ryoung@adem.state.al.us