Alabama Department of Environmental Management

Ecological Reference Reach

Rivers and Streams Monitoring Program

2010 Monitoring Summary

Good

Shoal Creek at FS Road 500 Talladega National Forest (Cleburne County) (33.72529/-85.60115)

BACKGROUND

Shoal Creek is one of the streams the Alabama Department of Environmental Management (ADEM) monitors as a "best attainable condition" reference watershed for comparison with streams throughout the Talladega Upland ecoregion. Additionally, ADEM included the Shoal Creek watershed for biological and water quality monitoring as part of the 2010 Assessment of the Alabama, Coosa, Tallapoosa (ACT) River Basins. The objectives of the ACT Basin Assessments were to assess the biological integrity of each monitoring site and to estimate overall water quality within the ACT basin group.

Figure 1. Upstream view of Shoal Creek at SHLC-3, September 8, 2010.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Shoal Creek is a *Swimming/Fish & Wildlife (S/F&W)* stream that drains Talladega National Forest in west Cleburne County before flowing into Whitesides Mill Lake in Calhoun County. It is a tributary of Choccolocco Creek. Based on the 2006 National Land Cover Dataset, land use within the watershed is primarily forest (97%). As of September 1, 2012, ADEM has issued no NPDES permits in 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. Shoal Creek at SHLC-3 is a high gradient riffle-run stream. Instream substrates are a composed of boulder, cobble, gravel, and sand (Figure 1). The habitat assessment resulted in an *optimal* rating in all categories.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Coosa River
Drainage Area (mi^2)		18
Ecoregion[a]		45d
% Landuse		
Open water		<1
Wetland	Woody	<1
Forest	Deciduous	49
	Evergreen	47
	Mixed	1
Shrub/scrub		<1
Grassland/herbaceous		<1
Pasture/hay		<1
Development	Open space	2
Barren		<1
Population/km^2[b]		2
# NPDES Permits	**TOTAL**	0

a.Talladega Upland

b.2000 US Census

Table 2. Physical characteristics of Shoal Creek at SHLC-3, May 28, 2010.

Physical Characteristics		
Width (ft)		40
Canopy Cover		Shaded
Depth (ft)		
	Riffle	1.0
	Run	1.0
	Pool	3.5
% of Reach		
	Riffle	20
	Run	60
	Pool	20
% Substrate		
	Boulder	20
	Cobble	14
	Mud/Muck	2
	Gravel	14
	Sand	40
	Silt	2
	Organic Matter	8

BIOASSESSMENT RESULTS

Benthic macroinvertebrate communities were sampled using ADEM's Intensive Multi-habitat Bioassessment methodology (WMB-I). Table 4 summarizes results of taxonomic richness, community composition, and community tolerance metrics. 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 metric scores. Metric results indicated the macroinvertebrate community in Shoal Creek at SHLC-3 to be in *good* condition.

Table 3. Results of the habitat assessment conducted in Shoal Creek at SHLC-3, May 28, 2010.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	73	Optimal >70
Sediment Deposition	74	Optimal >70
Sinuosity	95	Optimal >84
Bank and Vegetative Stability	95	Optimal >74
Riparian Buffer	93	Optimal >89
Habitat Assessment Score	**200**	
% Maximum Score	**83**	**Optimal >70**

Table 4. Results of the macroinvertebrate bioassessment conducted in Shoal Creek at SHLC-3, May 28, 2010.

Macroinvertebrate Assessment		
	Results	**Scores**
Taxa richness and diversity measures		**(0-100)**
# EPT taxa	27	100
Shannon Diversity	4.55	86
Taxonomic composition measures		
% EPT minus Baetidae and Hydropsychidae	22	23
% Non-insect taxa	12	55
Tolerance measures		
% Tolerant taxa	19	87
WMB-I Assessment Score	**---**	**70**
WMB-I Assessment Rating		**Good (70-85)**

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. In situ measurements and water samples were collected May, July, September, and November 2010 to help identify any stressors to the biological communities. In situ parameters were also measured during the macroinvertebrate assessment. Shoal Creek met *S*/*F&W* use classification criteria for temperature, turbidity, dissolved oxygen and pathogens. Median Kjeldahl nitrogen was slightly higher than expected for the ecoregion. Dissolved arsenic exceeded Human Health (HH) criteria for fish consumption once in May. Dissolved chromium and dissolved copper data samples exceeded *F&W* hardness-adjusted Aquatic Life Use (ALU) criteria in September. Organics samples were not collected.

SUMMARY

Shoal Creek at SHLC-3 represents the best-attainable condition when compared to other streams in the Talladega Upland ecoregion. The macroinvertebrate community was determined to be in *good* condition. Habitat was rated o*ptimal* overall, as well as in in all sub-categories, which is an outstanding result. Water quality analyses detected dissolved arsenic, copper, and chromium above *F&W* criteria during one sampling event. Sampling should continue to identify the source of the higher than normal metals concentrations. Additional low-level metals sampling may be necessary to determine if the criteria exceedances are due to natural conditions or anthropogenic sources.

Table 5. Summary of water quality data collected during 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	Med	Avg	SD	E
Physical							
Temperature (°C)	6	11.6	25.0	21.7	20.5	4.6	
Turbidity (NTU)	6	1.5	11.4	1.9	3.5	3.9	
Total Dissolved Solids (mg/L)	4	4.0	30.0	26.0	21.5	11.9	
Total Suspended Solids (mg/L)	4	< 1.0	9.0	1.2	3.0	4.1	
Specific Conductance (µmhos)	6	21.3	40.5	33.9	32.5	7.8	
Hardness (mg/L)	4	6.6	13.4	10.6	10.3	3.1	
Alkalinity (mg/L)	4	5.9	23.9	12.6	13.8	7.6	
Stream Flow (cfs)	6	1.5	100.6	6.0	22.2	38.8	
Chemical							
Dissolved Oxygen (mg/L)	6	7.4	9.3	8.0	8.2	0.7	
pH (su)	6	6.5	6.9	6.8	6.7	0.2	
Ammonia Nitrogen (mg/L)	4	< 0.021	< 0.021	0.010	0.010	0.000	
Nitrate+Nitrite Nitrogen (mg/L)	4	< 0.002	0.118	0.035	0.047	0.055	
Total Kjeldahl Nitrogen (mg/L)	4	< 0.080	0.413	0.260 M	0.244	0.154	
Total Nitrogen (mg/L)	4	< 0.104	0.419	0.320	0.291	0.143	
J Dissolved Reactive Phosphorus (mg/L)	4	0.006	0.013	0.011	0.010	0.003	
Total Phosphorus (mg/L)	4	0.015	0.025	0.016	0.018	0.005	
CBOD-5 (mg/L)	4	< 2.0	< 2.0	1.0	1.0	0.0	
COD (mg/L)	4	< 1.8	35.5	0.9	9.6	17.3	
J TOC (mg/L)	4	1.0	2.8	2.0	1.9	0.9	
Chlorides (mg/L)	4	0.8	1.5	1.2	1.2	0.3	
Total Metals							
Aluminum (mg/L)	4	< 0.033	0.228	0.019	0.071	0.105	
J Iron (mg/L)	4	0.190	0.454	0.275	0.298	0.128	
J Manganese (mg/L)	4	< 0.001	0.048	0.018	0.021	0.020	
Dissolved Metals							
Aluminum (mg/L)	4	< 0.033	< 0.043	0.016	0.018	0.002	
Antimony (µg/L)	4	< 1.9	< 1.9	0.9	0.9	0.0	
J Arsenic (µg/L)	4	< 1.6	< 2.1 H	1.0	1.2	0.3	1
Cadmium (mg/L)	4	< 0.000	< 0.014	0.001	0.002	0.003	
J Chromium (mg/L)	4	< 0.009	< 0.019 S	0.006	0.009	0.007	1
J Copper (mg/L)	4	< 0.013	< 0.020 S	0.008	0.010	0.005	1
J Iron (mg/L)	4	0.103	0.252	0.135	0.156	0.069	
Lead (µg/L)	4	< 1.7	< 1.7	0.8	0.8	0.0	
J Manganese (mg/L)	4	< 0.001	0.009	0.003	0.004	0.004	
Mercury (µg/L)	4	< 0.1	< 0.1	0.0	0.0	0.0	
Nickel (mg/L)	4	< 0.019	< 0.042	0.010	0.012	0.006	
Selenium (µg/L)	4	< 1.7	< 1.7	0.8	0.8	0.0	
Silver (mg/L)	4	< 0.000	< 0.002	0.000	0.000	0.001	
Thallium (µg/L)	4	< 0.6	< 0.6	0.3	0.3	0.0	
J Zinc (mg/L)	4	< 0.016	< 0.030	0.015	0.015	0.000	
Biological							
Chlorophyll a (ug/L)	4	0.27	2.67	1.20	1.34	1.00	
J E. coli (col/100mL)	4	32	192	75	94	73	

E=#samples that exceed criterion; H=*F&W* Human Health criterion exceeded; J=estimate; M=value>90% of all verified ecoregional reference reach data collected in ecoregion 45d; N=# of samples; S= *F&W* hardness-adjusted aquatic life use criterion exceeded.

FOR MORE INFORMATION, CONTACT:
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