Alabama Department of Environmental Management

Ecological Reference Site

Rivers and Streams Monitoring Program

2005 Monitoring Summary

Good

Shoal Creek at Forest Service Rd 500 (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 Piedmont ecoregion.

Additionally, Shoal Creek was selected for biological and water quality monitoring as part of the 2005 Assessment of the Alabama, Coosa, and 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.

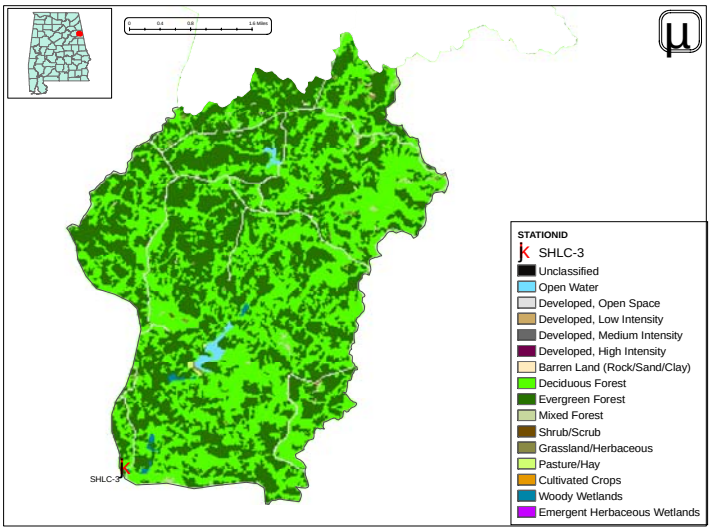

Figure1. Sampling location and landuse within the Shoal Creek watershed at SHLC-3.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Shoal Creek is a small stream designated *Swimming/Fish and Wildlife (S/F&W)*. It drains approximately 18mi^2 in Talladega National Forest. It is located within the Talladega Upland (45d) part of the Piedmont ecoregion, which contains the higher elevations and tends to be more mountainous, dissected and heavily forested than the other subecoregions of the Piedmont. Landuse in the watershed is primarily (97%) forest. Additionally, as of June 9, 2008, ADEM's NPDES Management System database did not show any permitted discharge located within the watershed.

REACH CHARACTERISTICS

General observations (Table 2) and habitat assessments (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 characterized by gravel, bedrock, and cobble substrates. The presence of stable substrate and riffles within the stream reach categorized overall habitat quality as *optimal* for supporting macroinvertebrate communities.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
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]		12

a.Talladega Upland

b.2000 US Census data

Table 2. Physical characteristics at SHLC-3, May 5, 2005.

Physical Characteristics		
Width (ft)		35
Canopy cover		Mostly Shaded
Depth (ft)		
	Riffle	0.75
	Run	1.8
	Pool	3.0
% of Reach		
	Riffle	35
	Run	30
	Pool	35
% Substrate		
	Bedrock	25
	Boulder	5
	Cobble	20
	Gravel	38
	Sand	5
	Silt	2
	Organic Matter	5

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 an average of all individual metric scores. The final score indicated the biological community to be in *good* condition (Table 4).

Table 3. Results of habitat assessment conducted at SHLC-3, May 5, 2005.

Habitat Assessment (% Maximum Score)		Rating
Instream habitat quality	83	Optimal (> 70)
Sediment deposition	84	Optimal (> 70)
Sinuosity	78	Sub-optimal (65-84)
Bank and vegetative stability	89	Optimal (≥75)
Riparian buffer	90	Sub-optimal (70-90)
Habitat assessment score	205	
% Maximum score	**85**	**Optimal (> 70)**

Table 4. Results of macroinvertebrate assessment conducted at SHLC-3, May 5, 2005.

Macroinvertebrate Assessment Results			
	Results	**Scores**	**Rating**
Taxa richness measures		**(0-100)**	
# Ephemeroptera (mayfly) genera	10	83	Good (71-85)
# Plecoptera (stonefly) genera	7	100	Excellent (>75)
# Trichoptera (caddisfly) genera	10	83	Good (67-83)
Taxonomic composition measures			
% Non-insect taxa	9	65	Fair (49.4-74.1)
% Non-insect organisms	1	97	Excellent (>97)
% Plecoptera	5	24	Good (19.7-59.8)
Tolerance measures			
Beck's community tolerance index	38	100	Excellent (>80.4)
WMB-I Assessment Score	**---**	**79**	**Good (72-86)**

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. In situ measurements and water samples were collected monthly, semi-monthly (metals), or quarterly (pesticides, herbicides (atrazine), and semi-volatile organics) during March through October of 2005 to help identify any stressors to the biological communities. *In situ* measurements indicated that Shoal Creek at SHLC-3 was meeting water quality criteria for its *S/F&W* water use classification. Dissolved oxygen (DO) concentrations ranged from 7.6 - 10.2 mg/L. Fecal coliform counts were ≤100col/100mL during all site visits despite sampling during some high flow events. Median values of all physical and chemical parameters were within the range of values expected at ADEM's verified least-impaired ecoregional reference reaches.

CONCLUSIONS

The condition of the macroinvertebrate community residing in Shoal Creek at SHLC-3 was rated as *good*, with a high number of pollution sensitive taxa represented. Results of intensive water quality sampling suggest that Shoal Creek exceeds its *S/F&W* use classification and is in very good condition overall. This supports its continued use as an ADEM ecological reference site.

Table 5. Summary of water quality data collected March-October, 2005. 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 for each parameter.

Parameter	N	Min	Max	Median	Avg	SD
Physical						
Temperature (°C)	6	15.0	26.0	20.0	20.3	4.3
Turbidity (NTU)	6	1.3	5.1	2.7	2.9	1.5
Total dissolved solids (mg/L)	6	9.0	24.0	14.0	15.0	5.0
Total suspended solids (mg/L)	6	5.0	14.0	8.0	8.8	3.3
Specific conductance (µmhos)	6	23.3	31.8	26.0	26.9	3.3
Hardness (mg/L)	4	5.2	9.5	6.6	7.0	1.9
Alkalinity (mg/L)	6	4.5	9.4	6.8	6.7	1.6
Stream Flow (cfs)	6	13.8	103.1	35.3	51.2	---
Chemical						
Dissolved oxygen (mg/L)	6	7.6	10.2	9.1	8.9	1.1
pH (su)	6	6.6	7.52	7.0	7.0	0.3
Ammonia Nitrogen (mg/L)	6	< 0.015	< 0.015	0.011	0.011	0.004
Nitrate+Nitrite Nitrogen (mg/L)	6	< 0.003	0.034	0.009	0.012	0.012
Total Kjeldahl Nitrogen (mg/L)	6	< 0.150	0.166	0.075	0.090	0.037
Total nitrogen (mg/L)	6	0.076	0.173	0.088	0.102	0.037
Dissolved reactive phosphorus (mg/L)	6	< 0.004	0.021	0.006	0.009	0.007
Total phosphorus (mg/L)	6	< 0.004	0.063	0.030	0.034	0.025
CBOD-5 (mg/L)	6	< 1.0	3.2	1.2	1.6	1.2
COD (mg/L)	6	< 2.0	< 2.0	1.0	1.0	0.0
J Chlorides (mg/L)	6	3.2	2.0	3.5	3.5	0.2
Atrazine (µg/L)	1				< 0.05	
Total Metals						
Aluminum (mg/L)	3	< 0.015	0.063	0.046	0.039	0.028
Iron (mg/L)	3	0.185	0.417	0.378	0.327	0.124
Manganese (mg/L)	3	0.015	0.023	0.02	0.019	0.004
Dissolved Metals						
Aluminum (mg/L)	3	< 0.015	< 0.015	0.0075	0.008	0.0
Antimony (µg/L)	3	< 2	< 2	1	1	0
Arsenic (µg/L)	3	< 10	< 10	5	5	0
Cadmium (mg/L)	3	< 0.005	< 0.005	0.0025	0.0025	0.0
Chromium (mg/L)	3	< 0.004	< 0.004	0.002	0.002	0.0
Copper (mg/L)	3	< 0.005	< 0.005	0.0025	0.003	0.0
Iron (mg/L)	3	0.065	0.223	0.065	0.1177	0.091
Lead (µg/L)	3	< 2	< 2	1	1	0
Manganese (mg/L)	3	< 0.005	< 0.005	0.0025	0.003	0.0
J Mercury (µg/L)	3	< 0.3	< 0.3	0.15	0.2	0.1
Nickel (mg/L)	3	< 0.006	< 0.006	0.003	0.003	0.0
Selenium (µg/L)	3	< 10	< 10	5	5	0
Silver (mg/L)	3	< 0.003	< 0.003	0.0015	0.0015	0.0
Thallium (µg/L)	3	< 1	< 1	0.5	0.500	0.0
Zinc (mg/L)	3	< 0.006	< 0.006	0.003	0.003	0.0
Biological						
J Chlorophyll *a* (µg/L)	6	0.27	3.74	1.07	1.29	1.2
J Fecal Coliform (col/100 mL)	6	7	100	24	34	33

J=estimate; N=# samples; Min=minimum; Max=maximum.

FOR MORE INFORMATION, CONTACT:
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