

# 2005 Monitoring Summary



## Shirtee Creek at Talladega County Road 24 (33.21167/-86.27306)

### BACKGROUND

Shirtee Creek at SHRT-1 (SHIRTEE-3) is one of a network of 94 sites monitored annually by the Alabama Department of Environmental Management (ADEM) to identify long-term trends in water quality and to provide data for the development of Total Maximum Daily Loads (TMDL) and water quality criteria.

Shirtee Creek was also 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.

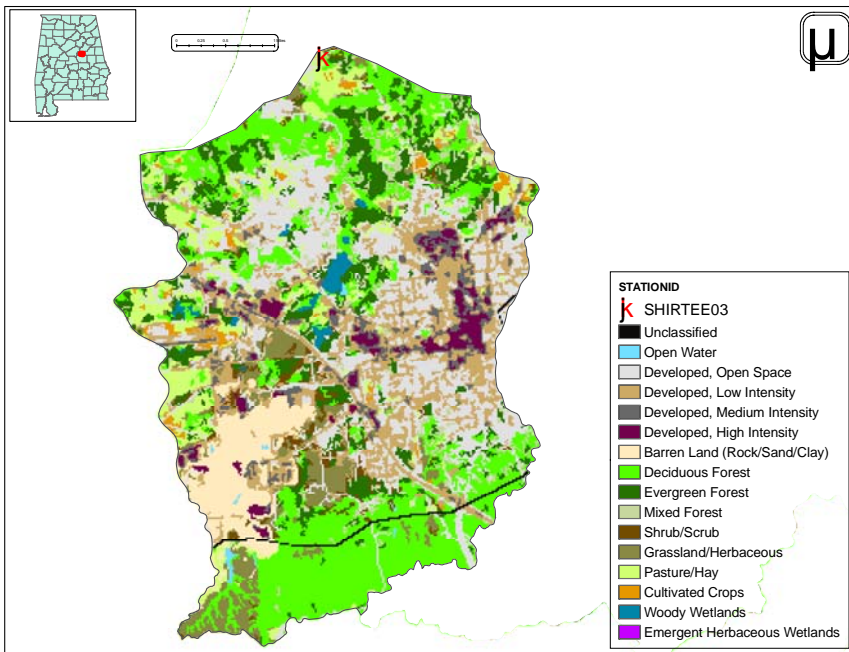


Figure 1. Sampling location and landuse within the Shirtee Creek watershed at SHRT-1.

### WATERSHED CHARACTERISTICS

The Shirtee Creek watershed at SHRT-1 (SHIRTEE-3) is located in Talladega County and lies within the Southern Limestone/Dolomite valleys and low rolling hills (67f) ecoregion (Table 1). A total of fifty eight permits have been issued within the watershed. Population density is also high because the stream drains through the city of Sylacauga. Urban areas comprise 39% of the watershed. Thirty seven percent of the watershed is composed of wetlands and forests.

### 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. Shirtee Creek at SHRT-1 (SHIRTEE-3) is a moderate gradient, riffle-run stream reach composed of bedrock, boulder, cobble, gravel and sand substrates. The presence of stable substrates within the stream reach categorized overall habitat quality as *optimal*, although sediment deposition and a lack of pool habitat were noted as issues within the reach.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Drainage Area (mi <sup>2</sup> )		18
Ecoregion <sup>a</sup>		67f
% Landuse		
Open water		<1
Wetland	Woody	1
Forest	Deciduous	22
	Evergreen	10
	Mixed	4
Shrub/scrub		2
Grassland/herbaceous		6
Pasture/hay		7
Cultivated crops		1
Development	Open space	19
	Low intensity	14
	Moderate intensity	4
	High intensity	2
Barren		6
Population/km <sup>2b</sup>		204
# NPDES Permits <sup>c</sup>	<b>TOTAL</b>	58
Construction Stormwater		30
Mining		3
Mining General Permit (old)		10
Industrial General		1
Industrial Individual		6
Municipal Individual		7
Underground Injection Control		1

a.Southern Limestone/Dolomite Valleys and Low Rolling Hills

b.2000 US Census data

c.#NPDES permits downloaded from ADEM's NPDES Management System database, 9 Jun 2008

Table 2. Physical characteristics of Shirtee Creek at SHRT-1 (SHIRTEE-3), June 29, 2005.

Physical Characteristics		
Width (ft)		30
Canopy cover		Mostly Shaded
Depth (ft)	Riffle	0.6
	Run	1.0
% of Reach	Riffle	2
	Run	98
% Substrate	Bedrock	3
	Boulder	4
	Cobble	8
	Gravel	45
	Sand	36
	Silt	2
	Organic Matter	2

**Table 3.** Results of the habitat assessment conducted on Shirtee Creek at SHRT-1 (SHIRTEE-3), June 29, 2005.

Habitat Assessment (% Maximum Score)		Rating
Instream habitat quality	75	Optimal (>65)
Sediment deposition	38	Poor (<40)
Sinuosity	60	Marginal (45-64)
Bank and vegetative stability	78	Optimal (≥75)
Riparian buffer	84	Sub-optimal (70-90)
Habitat assessment score	168	
<b>% Maximum score</b>	<b>70</b>	<b>Optimal (&gt;65)</b>

**Table 4.** Results of the macroinvertebrate bioassessment conducted in Shirtee Creek at SHRT-1 (SHIRTEE-3), June 29, 2005.

Macroinvertebrate Assessment Results			
	Results Scores (0-100)		Rating
<b>Taxa richness measures</b>			
# Ephemeroptera (mayfly) genera	2	17	Very Poor (<23)
# Plecoptera (stonefly) genera	0	0	Very Poor (<16)
# Trichoptera (caddisfly) genera	4	33	Poor (22-44)
<b>Taxonomic composition measures</b>			
% Non-insect taxa	13	49	Poor (24.7-49.4)
% Non-insect organisms	6	83	Fair (62.7-93.9)
% Plecoptera	0	0	Very Poor (<6.56)
<b>Tolerance measures</b>			
Beck's community tolerance index	4	14	Very Poor (<20.2)
<b>WMB-I Assessment Score</b>	<b>---</b>	<b>28</b>	<b>Poor (24-48)</b>

## 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 the score for each metric. The relatively low taxa richness of caddisflies, and absence of stoneflies, two pollution-intolerant groups, and high percent dominance of pollution-tolerant organisms indicated the macroinvertebrate community to be in *poor* condition (Table 4).

## WATER CHEMISTRY

Results of water chemistry 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. Median values of specific conductivity, alkalinity, hardness, total dissolved solids, and chlorine were above the expected limit for the ecoregion 67f. Median concentrations of all the nutrients were also elevated.

## CONCLUSION

Bioassessment results indicated the macroinvertebrate community to be in *poor* condition. Intensive water quality sampling and habitat assessment results indicated nutrient enrichment and sedimentation to be potential causes of the degraded biological condition. Other parameters of concern include hardness, alkalinity, and chlorides and suggest urban runoff and point sources to be potential sources of stress to the macroinvertebrate community.

**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.

Parameter	N	Min	Max	Median	Avg	SD
<b>Physical</b>						
Temperature (°C)	7	13.0	27.0	19.0	20.6	5.9
Turbidity (NTU)	8	3.6	6.8	4.2	4.8	1.3
Total dissolved solids (mg/L)	7	38.0	493.0	261.0 <sup>M</sup>	262.1	147.3
Total suspended solids (mg/L)	7	6.0	39.0	9.0	14.3	11.6
Specific conductance (µmhos)	8	335.5	782.9	589.5 <sup>M</sup>	599.8	162.9
Hardness (mg/L)	5	136.0	172.0	146.0 <sup>M</sup>	151.4	15.5
Alkalinity (mg/L)	7	12.6	139.5	132.9 <sup>M</sup>	111.8	44.9
Stream Flow (cfs)	8	18.0	56.6	28.3	32.5	---
<b>Chemical</b>						
Dissolved oxygen (mg/L)	7	7.2	10.48	9.4	8.8	1.2
pH (su)	8	7.4	8.1	7.9	7.8	0.2
Ammonia Nitrogen (mg/L)	7	< 0.015	0.183	0.008	0.047	0.069
<sup>J</sup> Nitrate+Nitrite Nitrogen (mg/L)	7	1.930	6.190	2.767 <sup>M</sup>	3.227	1.426
Total Kjeldahl Nitrogen (mg/L)	7	0.324	0.829	0.655 <sup>M</sup>	0.595	0.209
Total nitrogen (mg/L)	7	2.644	7.019	3.243	3.821	1.524
Dissolved reactive phosphorus (mg/L)	7	< 0.004	0.810	0.440 <sup>M</sup>	0.431	0.303
<sup>J</sup> Total phosphorus (mg/L)	7	0.235	1.600	0.687 <sup>M</sup>	0.693	0.456
CBOD-5 (mg/L)	7	< 1.0	4.4	1.5	1.7	1.2
Chlorides (mg/L)	7	15.5	123.0	61.3 <sup>M</sup>	65.6	39.8
Atrazine (µg/L)	1	< 0.05	< 0.05	0.03	0.05	---
<b>Total Metals</b>						
Aluminum (mg/L)	4	0.051	0.096	0.079	0.076	0.0
Iron (mg/L)	4	0.091	0.2	0.1785	0.162	0.0
Manganese (mg/L)	4	0.009	0.071	0.022	0.031	0.0
<b>Dissolved Metals</b>						
Aluminum (mg/L)	4	< 0.015	< 0.015	0.0075	0.008	0.0
Antimony (µg/L)	4	< 2	< 2	1	1	0.0
Arsenic (µg/L)	4	< 10	< 10	5	5	0.0
Cadmium (mg/L)	4	< 0.005	< 0.005	0.0025	0.0025	0.0
Chromium (mg/L)	4	< 0.004	< 0.004	0.002	0.002	0.0
Copper (mg/L)	4	< 0.005	< 0.005	0.0025	0.003	0.0
Iron (mg/L)	4	< 0.005	0.134	0.0178	0.043	0.1
Lead (µg/L)	4	< 2	< 2	1	1	0.0
Manganese (mg/L)	4	< 0.005	< 0.005	0.0025	0.003	0.0
<sup>J</sup> Mercury (µg/L)	4	< 0.3	< 0.3	0.225	0.225	0.1
Nickel (mg/L)	4	< 0.006	< 0.006	0.003	0.003	0.0
Selenium (µg/L)	4	< 10	< 10	5	5	0.0
Silver (mg/L)	4	< 0.003	< 0.003	0.0015	0.0015	0.0
Thallium (µg/L)	4	< 1	< 1	0.5	0.500	0.0
Zinc (mg/L)	4	< 0.006	0.021	0.003	0.0075	0.0
<b>Biological</b>						
<sup>J</sup> Chlorophyll a (µg/L)	7	0.27	2.14	1.07	1.07	0.8
<sup>J</sup> Fecal Coliform (col/100 mL)	7	24	260	49	82	84

<sup>J</sup>=estimate; N=# samples; M=value>90% of all verified ecoregional reference reach data collected in the sub-ecoregion/ecoregion 67f.

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