

# 2009 Monitoring Summary



Ambient Monitoring Site

## Scarham Creek at Marshall County Rd 372 (34.29843/-86.11664)

### BACKGROUND

Scarham Creek at SCRL-2 is one of a network of 95 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. Scarham Creek was also selected for biological and water quality monitoring as part of the 2009 Assessment of the Tennessee (TN) River Basin. The objectives of the TN Basin Assessments were to assess the biological integrity of each monitoring site and to estimate overall water quality within the Tennessee basin. Additionally, effects of Best Management Practice (BMP) implemented in the watershed were also monitored.

Scarham Creek was listed on Alabama's 1996 Clean Water Act (CWA) §303(d) list of impaired waters (Assessment Unit AL06030001-270-01). The 24 mile stretch of Scarham Creek from Short Creek to its source is identified as being impacted by pesticides, ammonia, siltation, low dissolved oxygen/organic enrichment (DO/OE) and pathogens from numerous agricultural sources. TMDLs developed to address the pesticides, ammonia, DO/OE, and pathogen impairments were approved by EPA in 2002. EPA approved the siltation TMDL in 2003.



Figure 1. Scarham Creek, facing upstream, at SCRL-2. Photo taken 11/13/2008.

### WATERSHED CHARACTERISTICS

The Scarham Creek watershed at SCRL-2 lies within the Southern Table Plateaus (68d) ecoregion. Scarham Creek is a *Fish & Wildlife (F&W)* stream located near the city of Albertville. Based on the 2006 National Land Cover Dataset, landuse in the watershed is primarily pasture and forest (Table 1). ADEM's NPDES Management System database shows a total of 30 NPDES permits issued within this watershed as of September 1, 2012.

### 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. Scarham Creek at SCRL-2 is a riffle-run stream reach characterized by bedrock, boulder, cobble, and silt substrates (Figure 1). The presence of stable substrate and riffle habitat within the stream reach categorized overall habitat quality as *optimal* for a Southern Table Plateau stream.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin	Tennessee River	
Drainage Area (mi <sup>2</sup> )	54	
Ecoregion <sup>a</sup>	68d	
% Landuse		
Open water		<1
Wetland	Woody	<1
	Emergent herbaceous	<1
Forest	Deciduous	13
	Evergreen	4
	Mixed	12
Shrub/scrub		3
Grassland/herbaceous		1
Pasture/hay		49
Cultivated crops		11
Development	Open space	6
	Low intensity	1
	Moderate intensity	1
	High intensity	<1
Barren		<1
Population/km <sup>2b</sup>	252	
# NPDES Permits <sup>c</sup>	TOTAL	30
	Construction Stormwater	20
	Municipal Individual	9
	Underground Injection Control	1

a.Southern Table Plateaus

b.2000 US Census

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

Table 2. Physical characteristics of Scarham Creek at SCRL-2, June 9, 2009.

Physical Characteristics		
Width (ft)	44	
Canopy Cover	Mostly Shaded	
Depth (ft)	Riffle	1.5
	Run	3.0
	Pool	3.5
% of Reach	Riffle	40
	Run	50
	Pool	10
% Substrate	Bedrock	40
	Boulder	16
	Cobble	15
	Gravel	5
	Sand	4
	Silt	16
	Organic Matter	4

**Table 3.** Results of the habitat assessment conducted on Scarham Creek at SCRL-2, June 9, 2009.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	77	Optimal >70
Sediment Deposition	72	Optimal >70
Sinuosity	88	Optimal >84
Bank and Vegetative Stability	75	Optimal >74
Riparian Buffer	88	Sub-optimal (70-89)
<b>Habitat Assessment Score</b>	<b>188</b>	
<b>% Maximum Score</b>	<b>78</b>	<b>Optimal &gt;70</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 in comparison to least-impaired reference reaches in the same ecoregion. The final score is the average of all individual metric scores. The relatively low taxa richness of stoneflies, a pollution-intolerant group, and high percent dominance of pollution-tolerant non-insect taxa indicated the macroinvertebrate community to be in *poor* condition (Table 4).

**Table 4.** Results of macroinvertebrate bioassessment conducted in Scarham Creek at SCRL-2, June 9, 2009.

Macroinvertebrate Assessment		
	Results	Scores (0-100)
<b>Taxonomic composition measures</b>		
# EPT taxa	15	48
<b>Taxonomic composition measures</b>		
% Non-insect taxa	15	37
% Dominant taxon	40	20
% EPC taxa	22	9
<b>Functional feeding group measures</b>		
% Predators	10	38
<b>Tolerance measures</b>		
% Taxa as Tolerant	29	58
<b>WMB-I Assessment Score</b>	---	<b>35</b>
<b>WMB-I Assessment Rating</b>		<b>Poor (20-38)</b>

## WATER CHEMISTRY RESULTS

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 2009 to help identify any stressors to the biological communities.

The maximum stream flow (127.5 cfs) was measured in April. Flows could not be measured in May, September, or October due to nonwadeable conditions. Fecal coliform counts exceeded the F&W criterion of 2000 colonies/100mL of sample during the high flows experienced in September and October. Dissolved arsenic exceeded the Human Health criterion in August. Dissolved copper exceeded the Aquatic Life Use criterion in October. Specific conductance, hardness, phosphorus, and chlorophyll-a concentrations were higher than background for the ecoregion. Organics results from samples collected in June and October were less than the Minimum Detection Limit (MDL).

## SUMMARY

Bioassessment results indicated the macroinvertebrate community to be in *poor* condition, despite *optimal* habitat conditions. Water quality monitoring indicated that Scarham Creek at SCRL-2 had higher than expected dissolved metals, pathogen and nutrient concentrations. Monitoring of Scarham Creek at SCRL-2 should continue to ensure that water quality and biological conditions meet current standards. Low-level metals sampling may be needed to determine if criteria exceedances are due to natural conditions or anthropogenic sources.

**Table 5.** Summary of water quality data collected March-October, 2009. 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
<b>Physical</b>							
Temperature (°C)	10	11.4	23.1	20.0	18.3	4.5	
Turbidity (NTU)	10	1.1	102.0	7.3	22.4	32.2	
↓ Total Dissolved Solids (mg/L)	8	50.0	62.0	56.0	56.6	4.6	
↓ Total Suspended Solids (mg/L)	8	< 1.0	141.0	20.5	36.1	47.0	
Specific Conductance (µmhos)	10	67.7	103.0	88.2 <sup>G</sup>	87.7	9.5	
Hardness (mg/L)	4	24.2	98.7	30.3 <sup>G</sup>	45.9	35.4	
Alkalinity (mg/L)	8	8.3	38.1	14.6	20.3	12.2	
Stream Flow (cfs)	5	<0.1	127.5	11.9	44.0	50.8	
<b>Chemical</b>							
Dissolved Oxygen (mg/L)	10	6.8	10.3	8.4	8.6	1.3	
pH (su)	10	6.1	7.7	6.9	7.0	0.4	
↓,B Ammonia Nitrogen (mg/L)	4	< 0.006	0.047	0.005	0.015	0.021	
↓,B Nitrate+Nitrite Nitrogen (mg/L)	7	0.014	4.412	0.214	1.181	1.606	
↓,B Total Kjeldahl Nitrogen (mg/L)	4	0.260	1.669	0.433	0.699	0.652	
↓,B Total Nitrogen (mg/L)	4	0.331	3.235	1.440	1.612	1.372	
↓ Dissolved Reactive Phosphorus (mg/L)	8	0.012	0.179	0.045 <sup>M</sup>	0.071	0.060	
↓,B Total Phosphorus (mg/L)	4	0.030	0.277	0.060 <sup>M</sup>	0.106	0.115	
↓ CBOD-5 (mg/L)	8	< 1.0	2.0	0.8	0.8	0.5	
Chlorides (mg/L)	8	3.4	6.7	5.0	5.0	1.1	
Atrazine (µg/L)	2	< 0.06	0.08	0.05	0.05	0.04	
<b>Total Metals</b>							
↓ Aluminum (mg/L)	4	< 0.060	0.906	0.131	0.300	0.411	
Iron (mg/L)	4	0.281	1.010	0.288	0.466	0.362	
↓ Manganese (mg/L)	4	0.030	0.128	0.044	0.062	0.045	
<b>Dissolved Metals</b>							
↓ Aluminum (mg/L)	4	< 0.033	0.060	0.030	0.030	0.011	
Antimony (µg/L)	4	< 0.7	< 6.0	1.7	1.7	1.5	
↓ Arsenic (µg/L)	4	< 0.4	1.6 <sup>H</sup>	0.5	0.5	0.3	1
Cadmium (µg/L)	4	< 2.000	< 3.000	1.250	1.250	0.289	
Chromium (mg/L)	4	< 0.007	< 0.013	0.005	0.005	0.002	
↓ Copper (mg/L)	4	< 0.013	0.200 <sup>A</sup>	0.062	0.057	0.050	1
↓ Iron (mg/L)	4	< 0.026	0.208	0.133	0.122	0.084	
Lead (µg/L)	4	< 0.6	< 1.5	0.6	0.6	0.2	
↓ Manganese (mg/L)	4	< 0.001	0.037	0.024	0.021	0.016	
↓,B Mercury (µg/L)	3	< 0.080	< 0.080	0.040	0.040	0.000	
Nickel (mg/L)	4	< 0.004	< 0.019	0.004	0.005	0.003	
Selenium (µg/L)	4	< 0.4	< 1.5	0.2	0.3	0.3	
Silver (µg/L)	4	< 1.000	< 2.000	0.750	0.750	0.289	
Thallium (µg/L)	4	< 0.4	< 0.5	0.2	0.2	0.0	
Zinc (mg/L)	4	< 0.003	< 0.060	0.022	0.019	0.014	
<b>Biological</b>							
Chlorophyll a (ug/L)	8	< 1.00	10.68	2.54 <sup>M</sup>	3.84	3.44	
↓ Fecal Coliform (col/100 mL)	8	54	4100 <sup>C</sup>	220	1,104	1,494	2

A=F&W aquatic life use criterion exceeded; B=one or more samples excluded from calculations because they did not meet laboratory QC requirements; C=value exceeds criterion for F&W use classification; E= # of samples that exceeded criterion; G=value > median concentration of all verified reference data collected in ecoregion 68d; H=F&W human health criterion exceeded (fish consumption); J=reported value is an estimate; M=values > 90th percentile of all verified reference data collected in ecoregion 68d; N=# samples.