

# 2009 Monitoring Summary



## Second Creek at Lauderdale County Road 90 (34.95337/-88.02911)

### BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Second Creek watershed for biological and water quality monitoring as part of the 2009 Assessment of the Tennessee (TN) River Basin. The objectives of the Tennessee River Basin Assessments were to assess the biological integrity of each monitoring location and to estimate overall water quality within the TN basin.



Figure 1. Second Creek at SNDL-1 on April 14, 2009, facing downstream.

### WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Second Creek is a *Fish and Wildlife (F&W)* stream located near the city of Waterloo in the Tennessee River basin. At SNDL-1, the stream drains approximately sixty-five square miles. Second Creek watershed has a very low population density. Based on the 2006 National Land Cover Dataset, landuse within the watershed is primarily forest (72%), with some shrub/scrub areas. As of September 1, 2012, only one NPDES permit has been issued 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. Second Creek at SNDL-1 is a moderate-gradient, riffle-run stream characterized primarily by gravel and cobble (Figure 1). Overall habitat quality was categorized as *optimal* due to excellent channel morphology, good instream habitat, and little sedimentation.

### 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 the macroinvertebrate community to be in *good* condition (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		Tennessee River
<b>Basin</b>		Tennessee River
<b>Drainage Area (mi<sup>2</sup>)</b>		65
<b>Ecoregion<sup>a</sup></b>		65j
<b>% Landuse</b>		
Open water		<1
Wetland	Woody	1
	Emergent herbaceous	<1
Forest	Deciduous	54
	Evergreen	14
	Mixed	4
Shrub/scrub		15
Grassland/herbaceous		<1
Pasture/hay		6
Cultivated crops		3
Development	Open space	2
	Low intensity	<1
	Moderate intensity	<1
	High intensity	<1
Barren		<1
<b>Population/km<sup>2b</sup></b>		4
<b># NPDES Permits<sup>c</sup></b>	<b>TOTAL</b>	1
	Construction Stormwater	1

a. Transition Hills

b. 2000 US Census

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

Table 2. Physical characteristics of Second Creek at SNDL-1, June 24, 2009.

Physical Characteristics	
<b>Width (ft)</b>	30
<b>Canopy Cover</b>	Open
<b>Depth (ft)</b>	
	Riffle 0.9
	Run 1.2
	Pool 2.0
<b>% of Reach</b>	
	Riffle 50
	Run 40
	Pool 10
<b>% Substrate</b>	
	Boulder 1
	Cobble 37
	Gravel 50
	Sand 7
	Silt 2
	Organic Matter 3

**Table 3.** Results of the habitat assessment conducted on Second Creek at SNDL-1, June 24, 2009.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	86	Optimal >65
Sediment Deposition	74	Optimal >65
Sinuosity	93	Optimal >84
Bank and Vegetative Stability	66	Sub-optimal (60-74)
Riparian Buffer	64	Marginal (50-69)
<b>Habitat Assessment Score</b>	<b>180</b>	
<b>% Maximum Score</b>	<b>75</b>	<b>Optimal &gt;65</b>

**Table 4.** Results of macroinvertebrate bioassessment conducted in Second Creek at SNDL-1, June 24, 2009.

Macroinvertebrate Assessment		
	Results	Scores
<b>Taxa richness and diversity measures</b>		<b>(0-100)</b>
# EPT taxa	27	100
<b>Taxonomic composition measures</b>		
% EPT minus Baetidae and Hydropsychidae	13	27
% Non-insect taxa	11	57
<b>Functional feeding group</b>		
% Predator Individuals	6	19
<b>Community tolerance</b>		
% Tolerant taxa	18	90
<b>WMB-I Assessment Score</b>	---	<b>59</b>
<b>WMB-I Assessment Rating</b>		<b>Good (44-72)</b>

## WATER CHEMISTRY

Results of water chemistry samples 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. Dissolved copper exceeded the chronic freshwater aquatic life use (ALU) criteria during one of four sampling events. Median concentrations of samples indicated that parameters were within the 90th percentile of data collected at the reference reaches within ecoregion 65j.

## SUMMARY

Results of ADEM's 2009 macroinvertebrate bioassessment indicated the macroinvertebrate community to be in *good* condition. Second Creek at SNDL-1 had little sedimentation, good instream cover and channel morphology, resulting in an *optimal* habitat quality score. Additional low-level metals sampling may be necessary to determine if the criterion exceedance is due to natural conditions or anthropogenic sources.

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**Table 5.** Summary of water quality data collected March-October, 2009. Minimum (Min) and maximum (Max) values calculated using minimum detection limits (MDL). Median (Med), 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)	9	12.3	25.4	21.1	19.7	4.9	
Turbidity (NTU)	9	1.2	3.0	2.1	2.2	0.6	
<sup>J</sup> Total Dissolved Solids (mg/L)	8	6.0	51.0	20.5	22.9	17.3	
Total Suspended Solids (mg/L)	8	< 0.3	3.0	0.8	1.3	1.2	
Specific Conductance (µmhos)	9	24.1	26.8	25.8	25.7	0.8	
Hardness (mg/L)	4	7.7	9.6	8.9	8.8	0.9	
Alkalinity (mg/L)	8	4.9	7.6	6.0	6.1	1.0	
Stream Flow (cfs)	8	14.8	174.3	44.0	68.8	54.1	
<b>Chemical</b>							
Dissolved Oxygen (mg/L)	9	8.2	10.9	8.4	8.9	1.0	
pH (su)	9	6.0	7.0	6.4	6.5	0.3	
<sup>BJ</sup> Ammonia Nitrogen (mg/L)	4	< 0.006	< 0.014	0.003	0.004	0.002	
<sup>BJ</sup> Nitrate+Nitrite Nitrogen (mg/L)	6	< 0.003	0.818	0.137	0.229	0.295	
<sup>BJ</sup> Total Kjeldahl Nitrogen (mg/L)	4	< 0.089	0.380	0.228	0.220	0.144	
<sup>BJ</sup> Total Nitrogen (mg/L)	4	< 0.154	0.545	0.370	0.359	0.161	
<sup>J</sup> Dissolved Reactive Phosphorus (mg/L)	8	0.009	0.092	0.014	0.035	0.036	
<sup>BJ</sup> Total Phosphorus (mg/L)	4	< 0.005	0.011	0.010	0.008	0.004	
CBOD-5 (mg/L)	8	< 1.0	< 2.0	0.5	0.7	0.3	
Chlorides (mg/L)	8	0.8	8.5	1.3	2.2	2.6	
Atrazine (µg/L)	2	< 0.06	0.38	0.20	0.20	0.25	
<b>Total Metals</b>							
<sup>J</sup> Aluminum (mg/L)	4	0.017	< 0.060	0.030	0.030	0.011	
<sup>J</sup> Iron (mg/L)	4	0.024	0.076	0.032	0.041	0.024	
Manganese (mg/L)	4	< 0.001	< 0.009	0.004	0.004	0.002	
<b>Dissolved Metals</b>							
Aluminum (mg/L)	4	< 0.033	< 0.060	0.030	0.027	0.007	
Antimony (µg/L)	4	< 0.7	< 6.0	3.0	2.3	1.3	
Arsenic (µg/L)	4	< 0.4	< 0.4	0.2	0.2	0.0	
Cadmium (mg/L)	4	< 0.002	< 0.003	0.001	0.001	0.000	
Chromium (mg/L)	4	< 0.007	< 0.013	0.004	0.004	0.002	
<sup>J</sup> Copper (mg/L)	4	0.022 <sup>S</sup>	< 0.200	0.100	0.080	0.039	1
Iron (mg/L)	4	< 0.020	< 0.026	0.010	0.011	0.002	
Lead (µg/L)	4	< 1.0	< 1.5	0.8	0.7	0.1	
Manganese (mg/L)	4	< 0.001	< 0.009	0.004	0.004	0.002	
<sup>BJ</sup> Mercury (µg/L)	2	< 0.080	< 0.080	0.040	0.040	0.0	
Nickel (mg/L)	4	< 0.008	< 0.019	0.004	0.005	0.003	
Selenium (µg/L)	4	< 0.4	< 0.4	0.2	0.2	0.0	
Silver (mg/L)	4	< 0.001	< 0.002	0.001	0.001	0.000	
Thallium (µg/L)	4	< 0.4	< 0.4	0.2	0.2	0.0	
Zinc (mg/L)	4	< 0.030	< 0.060	0.030	0.026	0.008	
<b>Biological</b>							
Chlorophyll a (µg/L)	8	0.53	1.07	0.50	0.58	0.20	
<sup>J</sup> Fecal Coliform (col/100 mL)	8	1	73	27	29	22	

J=estimate; B= One or more samples excluded from calculations because they did not meet laboratory QC requirements; N=# samples; S=F&W hardness-adjusted aquatic life use criterion exceeded; E=# of samples that exceed criterion.