

# 2010 Monitoring Summary



Basin Assessment Site

## Little Canoe Creek at Beulah Circle Road, St. Clair County (33.78009/-86.36256)

### BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Little Canoe Creek watershed for biological and water quality monitoring as part of the 2010 Alabama-Coosa-Tallapoosa Basin Assessment Monitoring. The objectives of the ACT Basin Assessments were to assess biological conditions at each monitoring location, estimate overall water quality within the basin, identify impaired and reference reaches, and collect data for metric and criteria development.



Figure 1. Little Canoe Creek at LICs-1, September 9, 2010.

### WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Little Canoe Creek is a *Fish and Wildlife (F&W)* stream located in St. Clair County. Based on the 2006 National Land Cover Dataset, landuse within the watershed is primary forest (63%), with some pasture and grassland. As of September 4, 2012, 83 NPDES permits have been issued in this watershed, including 72 construction stormwater permits.

### 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. Little Canoe Creek at LICs-1 is a riffle-run stream with predominantly gravel and sand substrates (Figure 1). This watershed lies in the Southern Shale Valley subecoregion (67g). Overall habitat quality was categorized as *optimal*.

### BIOASSESSMENT RESULTS

The benthic macroinvertebrate community was 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 the average of all individual metric scores. Metric results indicated the macroinvertebrate community to be in *fair* community condition (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Coosa R
Drainage Area (mi <sup>2</sup> )		43
Ecoregion <sup>a</sup>		67g
% Landuse		
Open water		1
Wetland	Woody	3
	Emergent herbaceous	<1
Forest	Deciduous	45
	Evergreen	12
	Mixed	6
Shrub/scrub		5
Grassland/herbaceous		7
Pasture/hay		13
Cultivated crops		1
Development	Open space	6
	Low intensity	1
	Moderate intensity	<1
	High intensity	<1
Barren		1
Population/km <sup>2b</sup>		44
# NPDES Permits <sup>c</sup>	<b>TOTAL</b>	83
	Construction Stormwater	72
	Industrial General	2
	Municipal Individual	6

a. Southern Shale Valleys

b. 2000 US Census

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

Table 2. Physical characteristics of Little Canoe Creek at LICs-1, May 20, 2010.

Physical Characteristics		
Width (ft)		35
Canopy Cover		Mostly Shaded
Depth (ft)		
	Riffle	0.5
	Run	1.0
	Pool	2.0
% of Reach		
	Riffle	10
	Run	80
	Pool	10
% Substrate		
	Boulder	2
	Clay	2
	Cobble	5
	Gravel	33
	Sand	33
	Silt	12
	Organic Matter	13

**Table 3.** Results of the habitat assessment conducted on Little Canoe Creek at LICS-1, May 20, 2010.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	78	Optimal (>70)
Sediment Deposition	73	Optimal (>70)
Sinuosity	63	Marginal (45-64)
Bank and Vegetative Stability	63	Sub-optimal (60-74)
Riparian Buffer	79	Sub-optimal (70-89)
<b>Habitat Assessment Score</b>	<b>172</b>	
<b>% Maximum Score</b>	<b>71</b>	<b>Optimal (&gt;70)</b>

**Table 4.** Results of the macroinvertebrate bioassessment conducted in Little Canoe Creek at LICS-1, May 10, 2010.

Macroinvertebrate Assessment		
	Results	Scores
<b>Taxa richness and diversity measures</b>		<b>(0-100)</b>
# EPT taxa	23	83
Shannon Diversity	3.19	23
<b>Taxonomic composition measures</b>		
% EPT minus Baetidae and Hydropsychidae	90	98
% Non-insect taxa	12	53
<b>Tolerance measures</b>		
% Tolerant taxa	25	69
<b>WMB-I Assessment Score</b>	<b>---</b>	<b>65</b>
<b>WMB-I Assessment Rating</b>		<b>Fair (47-69)</b>

## 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 of 2010 to help identify any stressors to the biological community. Mercury exceeded *F&W* aquatic-life-use and human-health criteria in September and November. Arsenic was higher than expected for *F&W* streams based on human-health criteria for fish consumption in September, and lead was higher than expected in July. Additionally, the geometric mean of summer *E. coli* samples exceeded human-health criteria for *F&W* streams (228 col/mL). Total dissolved solids, specific conductance, hardness, alkalinity, nitrate+nitrite nitrogen, dissolved reactive phosphorus, chlorides, and copper were higher than expected when compared to reference data collected within ecoregion 67 (Ridge and Valley).

## SUMMARY

Bioassessment results indicated the macroinvertebrate community to be in *fair* condition. Overall habitat conditions were rated as *optimal*, with good instream habitat. However, levels of mercury, arsenic, lead, total dissolved solids, specific conductance, hardness, alkalinity, nitrate+nitrite nitrogen, dissolved reactive phosphorus, chlorides, and copper were elevated as compared to data from ADEM's least-impaired reference reaches in ecoregion 67. Monitoring should continue to ensure that water quality and biological conditions remain stable.

Although total dissolved arsenic was above expected values in Little Canoe Creek, ADEM criteria for arsenic are expressed as dissolved trivalent arsenic (arsenite—As III). Presently, studies are being conducted in order to provide a better understanding of the prevalence and areal distribution of dissolved trivalent arsenic to total arsenic in the State of Alabama. Upon conclusion of the studies, Little Canoe Creek will be reassessed for potential arsenic violations.

**Table 5.** Summary of water quality data collected May-November, 2010. Minimum (Min) and maximum (Max) values calculated using minimum detection limits (MDL). 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	Q
<b>Physical</b>								
Temperature (°C)	5	8.2	25.3	21.6	19.4	6.6		
Turbidity (NTU)	5	4.1	20.3	11.2	11.9	6.2		
Total Dissolved Solids (mg/L)	4	121.0	166.0	158.5 <sup>M</sup>	151.0	20.8		
Total Suspended Solids (mg/L)	4	5.0	14.0	7.0	8.2	4.0		
Specific Conductance (µmhos)	5	207.0	284.0	266.0 <sup>G</sup>	252.9	34.0		
Hardness (mg/L)	4	97.9	137.0	131.0 <sup>G</sup>	124.2	18.4		
Alkalinity (mg/L)	4	86.1	124.2	118.7 <sup>M</sup>	111.9	17.5		
Stream Flow (cfs)	5	9.3	36.1	13.0	19.9	12.8		
<b>Chemical</b>								
Dissolved Oxygen (mg/L)	5	7.6	11.5	8.1	8.9	1.6		
pH (su)	5	7.6	7.9	7.8	7.8	0.1		
<sup>J</sup> Ammonia Nitrogen (mg/L)	1	0.5	0.5	0.5	0.5	0.0		
Nitrate+Nitrite Nitrogen (mg/L)	4	0.381	0.684	0.446 <sup>M</sup>	0.489	0.134		
<sup>J</sup> Dissolved Reactive Phosphorus (mg/L)	4	0.036	0.106	0.074 <sup>M</sup>	0.072	0.033		
CBOD-5 (mg/L)	4	< 1.0	< 1.0	0.5	0.5	0.0		
Chlorides (mg/L)	4	6.9	23.7	13.8 <sup>M</sup>	14.5	7.8		
<sup>J</sup> Atrazine (µg/L)	2	< 0.02	0.05	0.03	0.03	0.03		
<b>Total Metals</b>								
<sup>J</sup> Aluminum (mg/L)	4	0.070	0.529	0.388	0.344	0.195		
Iron (mg/L)	4	0.201	0.552	0.326	0.352	0.148		
<sup>J</sup> Manganese (mg/L)	4	0.021	0.055	0.046	0.042	0.015		
<b>Dissolved Metals</b>								
Aluminum (mg/L)	4	< 0.02	< 0.02	0.01	0.01	0.0		
Antimony (µg/L)	4	< 0.5	< 0.5	0.2	0.2	0.0		
<sup>J</sup> Arsenic (µg/L)	4	< 1.0	1.3 <sup>A</sup>	0.5	0.7	0.4		1
<sup>J</sup> Cadmium (µg/L)	4	< 0.4	< 0.4	0.2	0.2	0.0		
Chromium (µg/L)	4	< 2.0	< 2.0	1.0	1.0	0.0		
Copper (mg/L)	4	< 0.2	< 0.2	0.1 <sup>S</sup>	0.1	0.0		
<sup>J</sup> Iron (mg/L)	4	< 0.030	0.044	0.023	0.026	0.014		
<sup>J</sup> Lead (µg/L)	4	< 2.0	3.8 <sup>S</sup>	1.0	1.7	1.4		1
<sup>J</sup> Manganese (mg/L)	4	0.011	0.025	0.024	0.021	0.006		
<sup>J</sup> Mercury (µg/L)	3	< 0.200	0.515 <sup>AH</sup>	0.290 <sup>A</sup>	0.302	0.208		2
Nickel (mg/L)	4	< 0.005	< 0.005	0.002	0.002	0.0		
Selenium (µg/L)	4	< 1.2	< 1.2	0.6	0.6	0.0		
Silver (µg/L)	4	< 1.0	1.0	0.5	0.5	0.0		
Thallium (µg/L)	4	< 0.7	< 0.7	0.4	0.4	0.0		
Zinc (mg/L)	4	< 0.030	< 0.030	0.015	0.015	0.0		
<b>Biological</b>								
Chlorophyll a (ug/L)	4	< 1.0	< 1.0	0.5	0.5	0.0		
<sup>J</sup> E. coli (col/100mL)	4	19	326	193 <sup>H</sup>	182	128		2

A=(*F&W*) aquatic life use criterion exceeded; E=# samples that exceeded criteria; G=value higher than median concentration of all verified ecoregional reference reach data collected in ecoregion 67; H=(*F&W*) human health criterion exceeded; J=estimate; M=value >90% percent of all verified ecoregional reference reach data collected in ecoregion 67; N=# samples; Q=# uncertain exceedances; S=(*F&W*) hardness-adjusted aquatic life use criteria exceeded.

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