

# 2012 Monitoring Summary



## Cahaba River at Shelby County Road 52 Bridge west of Helena (33.28469/-86.88281)

### BACKGROUND

Cahaba River at C-3 is one of a network of 94 ambient 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.

Cahaba River was also selected for biological and water quality monitoring as part of the 2012 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.

Cahaba River, from Buck Creek to Shelby County Road 52 (approximately 3.62 miles), has been on Alabama's Clean Water Act (CWA) §303(d) list of impaired waters for only partially meeting its *Fish and Wildlife (F&W)* water use classification since 1998. It was listed for pathogens and siltation. Development of a Total Maximum Daily Load (TMDL) is scheduled for 2013.



Figure 1. Cahaba River at C-3, August 7, 2012.

### WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Cahaba River is a *Fish & Wildlife (F&W)* stream located in Shelby County. Based on the 2006 National Land Cover Dataset, land cover within the watershed is approximately 55% forested. As of September 1, 2012, ADEM's NPDES Management System database showed 1663 permitted discharges located within the watershed.

### REACH CHARACTERISTICS

General observations (Table 2) and a 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. Cahaba River at C-3 is a high gradient river with a stable bottom, primarily made up of cobble and boulder (Figure 1). Overall habitat quality was categorized as *optimal* due mainly to a healthy amount of instream habitat (e.g. root banks, submerged logs).

Table 1. Summary of watershed characteristics.

Watershed Characteristics			Cahaba River
<b>Basin</b>			
<b>Drainage Area (mi<sup>2</sup>)</b>			334
<b>Ecoregion<sup>a</sup></b>			67h
<b>% Landuse</b>			
	Open water		1
	Wetland	Woody	1
		Emergent herbaceous	<1
	Forest	Deciduous	40
		Evergreen	10
		Mixed	5
	Shrub/scrub		2
	Grassland/herbaceous		3
	Pasture/hay		6
	Cultivated crops		1
	Development	Open space	15
		Low intensity	10
		Moderate intensity	3
		High intensity	1
	Barren		1
<b>Population/km<sup>2b</sup></b>			253
<b># NPDES Permits<sup>c</sup></b>	<b>TOTAL</b>		1663
	401 Water Quality Certification		28
	Construction Stormwater		1492
	Mining		14
	Industrial General		56
	Industrial Individual		3
	Municipal Individual		59
	Underground Injection Control		11

a.Southern Sandstone Ridges

b.2000 US Census

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

Table 2. Physical characteristics of Cahaba River at C-3, June 19, 2012.

Physical Characteristics		
<b>Canopy cover</b>		Open
<b>Width (ft)</b>		63
<b>Depth (ft)</b>		
	Riffle	1
	Run	1.2
	Pool	2
<b>% of Reach</b>		
	Riffle	7
	Run	60
	Pool	33
<b>% Substrate</b>		
	Bedrock	10
	Boulder	23
	Cobble	33
	Gravel	17
	Sand	17

**Table 3.** Results of the habitat assessment conducted on Cahaba River at C-3, on June 19, 2012.

Habitat Assessment	% Maximum Score	Rating
Instream Habitat Quality	74	Optimal (> 70)
Sediment Deposition	69	Sub-optimal (65-70)
Sinuosity	35	Poor (<45)
Bank and Vegetative Stability	60	Sub-optimal (60-74)
Riparian Buffer	80	Sub-optimal (70-89)
<b>Habitat Assessment Score</b>	<b>171</b>	
<b>% Maximum score</b>	<b>71</b>	<b>Optimal (&gt; 70)</b>

**Table 4.** Results of the macroinvertebrate bioassessment conducted in

Macroinvertebrate Assessment		
	Results	Scores
<b>Taxa richness and diversity measures</b>		
		<b>(0-100)</b>
# EPT taxa	17	57
Shannon Diversity	3.78	50
<b>Taxonomic composition measures</b>		
% EPT minus Baetidae and Hydropsychidae	12	25
% Non-insect taxa	15	38
<b>Tolerance measures</b>		
% Tolerant taxa	25	70
<b>WMB-I Assessment Score</b>	<b>---</b>	<b>48.0</b>
<b>WMB-I Assessment Rating</b>		<b>Fair (47-69)</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 the average of all individual metric scores. Metric results indicated the macroinvertebrate community in Cahaba River at C-3 to be in *fair* condition (Table 4).

## WATER CHEMISTRY

Results of water chemistry are presented in Table 5. In situ measurements and water samples were collected monthly or semi-monthly (metals) during January through December of 2012 to help identify any stressors to the biological communities. Specific conductance and hardness values were greater than median concentrations of reference data. Median values of total dissolved solids, alkalinity, nitrate+nitrite nitrogen, total nitrogen, dissolved reactive phosphorus, chlorides, dissolved arsenic and dissolved copper were higher than expected for the ecoregion, based on the 90th percentile of samples collected at least impaired reference reaches in the Southern Sandstone Ridges ecoregion. *E. coli* samples collected in July and September also exceeded the *F&W* summer criteria; however, these were both after heavy rain events.

## SUMMARY

As part of the Assessment Process, ADEM will review the monitoring information presented in this report, along with all other available data.

The habitat assessment results indicate the habitat to be in *optimal* condition; however, bioassessment results indicated the macroinvertebrate community to be in *fair* condition. Water chemistry analysis suggest the elevated levels total dissolved solids, alkalinity, nitrate+nitrite nitrogen, total nitrogen, dissolved reactive phosphorus, chlorides, dissolved arsenic and dissolved copper could be impacting the macroinvertebrate communities. These results indicate the need for further sampling.

**Table 5.** Summary of water quality data collected January-December 2012. 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	Q
<b>Physical</b>								
Temperature (°C)	13	11.9	27.9	22.1	20.4	6.2		
Turbidity (NTU)	13	1.7	71.3	7.0	15.4	20.0		
J Total Dissolved Solids (mg/L)	12	113.0	251.0	167.5 <sup>M</sup>	174.7	40.1		
J Total Suspended Solids (mg/L)	12	1.0	93.0	8.0	16.2	25.3		
Specific Conductance (µmhos/cm)	13	182.0	392.0	274.0 <sup>G</sup>	271.6	70.6		
Hardness (mg/L)	4	104.0	138.0	118.5 <sup>G</sup>	119.8	16.4		
Alkalinity (mg/L)	12	45.9	113.4	68.2 <sup>M</sup>	75.5	22.2		
Monthly Stream Flow (cfs)	12	78.0	1470.0	213.5	390.7	399.5		
Measured Stream Flow (cfs)	12	78.0	1470.0	213.5	390.7	399.5		
<b>Chemical</b>								
Dissolved Oxygen (mg/L)	13	6.9	13.2	8.6	9.2	1.9		
pH (SU)	13	7.4	8.4	7.8	7.9	0.2		
J Ammonia Nitrogen (mg/L)	12	< 0.010	< 0.028	0.014	0.012	0.006		
J Nitrate+Nitrite Nitrogen (mg/L)	12	0.535	3.550	1.255 <sup>M</sup>	1.546	1.007		
J Total Kjeldahl Nitrogen (mg/L)	12	0.238	0.888	0.420	0.492	0.212		
J Total Nitrogen (mg/L)	12	0.857	4.029	1.844 <sup>M</sup>	2.038	1.016		
Dis Reactive Phosphorus (mg/L)	12	0.017	0.390	0.118 <sup>M</sup>	0.144	0.119		
J Total Phosphorus (mg/L)	12	0.037	0.446	0.146 <sup>M</sup>	0.176	0.135		
J CBOD-5 (mg/L)	12	< 1.0	< 2.0	1.0	0.8	0.2		
J Chlorides (mg/L)	11	3.6	20.1	7.3 <sup>M</sup>	9.9	6.0		
<b>Total Metals</b>								
J Aluminum (mg/L)	4	0.059	0.187	0.108	0.116	0.053		
J Iron (mg/L)	4	0.176	0.297	0.232	0.234	0.050		
J Manganese (mg/L)	4	0.036	0.053	0.040	0.042	0.008		
Mercury (µg/L)	2	< 0.035	0.035	0.018	0.018	0.000		
<b>Dissolved Metals</b>								
J Aluminum (mg/L)	4	< 0.030	0.077	0.015	0.030	0.031		
Antimony (µg/L)	4	< 0.800	< 0.800	0.400	0.400	0.000		
J Arsenic (µg/L)	4	< 1.000	1.420 <sup>H</sup>	1.330	1.145	0.434		3
J Cadmium (µg/L)	4	< 0.090	< 0.090	0.045	0.045	0.000		
Chromium (µg/L)	4	< 5.000	< 5.000	2.500	2.500	0.000		
Copper (µg/L)	4	< 100.000	< 300.000	150.000 <sup>M</sup>	125.000	50.000		
J Iron (mg/L)	4	< 0.100	< 0.100	0.050	0.050	0.000		
Lead (µg/L)	4	< 1.600	< 1.600	0.800	0.800	0.000		
J Manganese (mg/L)	4	0.006	0.034	0.020	0.020	0.012		
Nickel (µg/L)	4	< 10.000	< 10.000	5.000	5.000	0.000		
Selenium (µg/L)	4	< 2.000	< 2.000	1.000	1.000	0.000		
J Silver (µg/L)	4	< 1.000	< 1.000	0.500	0.500	0.000		
Thallium (µg/L)	4	< 0.400	< 0.432	0.216	0.212	0.008		
J Zinc (µg/L)	4	< 20.000	< 20.000	10.000	10.000	0.000		
<b>Biological</b>								
J Chlorophyll a (mg/m <sup>3</sup> )	12	< 1.00	4.27	1.47	1.74	1.29		
<i>E. coli</i> (MPN/DL)	12	29.5	1553.1 <sup>H</sup>	166.0	430.6	553.5		2

E=# of samples that exceeded criteria; G=value higher than median concentration of all verified ecoregional reference reach data collected in the ecoregion 67h; H=*F&W* human health criterion exceeded; J=estimate; M=value >90% of all verified ecoregional reference reach data collected in the sub-ecoregion 67h; N=# samples; Q=# of uncertain exceedances.

FOR MORE INFORMATION, CONTACT:  
 Rebekah Moore, ADEM Aquatic Assessment Unit  
 1350 Coliseum Boulevard Montgomery, AL 36110  
 (334) 260-2759 rebekah.taylor@adem.alabama.gov