

# 2012 Monitoring Summary



## Mud Creek at Cullman County Road 538 (34.05242/-86.72396)

### BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Mud Creek watershed for biological and water quality monitoring as part of the 2012 Basin-wide Screening Assessment of the Black Warrior and Cahaba (BWC) River Basins. The screening assessments were conducted at stream reaches where land use estimates and non-point source information from the local Soil and Water Conservation Districts indicated a moderate or high potential for impairment from non-point sources in non-urban areas. Sites rated as “poor” using ADEM’s Screening-Level Macroinvertebrate Bioassessment methods (WMB-EPT) were prioritized for further monitoring to more fully assess biological conditions at the site, as well as the extent and cause of any impairment.



Figure 1. Mud Creek at MUDC-4, June 19, 2012.

### WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Mud Creek at MUDC-4 is a *Fish & Wildlife (F&W)* stream located in Cullman County. According to the 2006 National Land Cover Dataset, land use within the watershed consists of pasture/hay, forest, and some development. As of September 1, 2012, 12 outfalls are active 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. Mud Creek at MUDC-4 is a shallow stream with a bedrock substrate (Figure 1). Overall habitat quality was rated as *sub-optimal* for supporting a diverse aquatic macroinvertebrate community.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
<b>Basin</b>		Black Warrior River
<b>Drainage Area (mi<sup>2</sup>)</b>		16
<b>Ecoregion<sup>a</sup></b>		68d
<b>% Landuse</b>		
Open water		<1
Wetland	Woody	2
Forest	Deciduous	15
	Evergreen	7
	Mixed	6
Shrub/scrub		7
Grassland/herbaceous		2
Pasture/hay		38
Cultivated crops		6
Development	Open space	9
	Low intensity	5
	Moderate intensity	2
	High intensity	<1
Barren		<1
<b>Population/km<sup>2b</sup></b>		102
<b>#NPDES Permits<sup>c</sup></b>	<b>TOTAL</b>	12
	401 Water Quality Certification	1
	Construction Stormwater	6
	Industrial General	2
	Industrial Individual	2
	Underground Injection Control	1

a.Southern Table Plateaus

b.2000 US Census

c.#NPDES outfalls downloaded from ADEM’s NPDES Management System database September 1, 2012.

Table 2. Physical characteristics of Mud Creek at MUDC-4 on May 2, 2012.

Physical Characteristics		
<b>Width (ft)</b>		35
<b>Canopy</b>		Open
<b>Depth (ft)</b>	Riffle	0.5
	Run	1.0
	Pool	1.0
<b>% of Reach</b>	Riffle	10
	Run	70
	Pool	20
<b>% of Substrate</b>	Bedrock	65
	Bolder	10
	Cobble	15
	Gravel	1
	Sand	1
	Silt	2
	Organic Matter	6

**Table 3.** Results of the habitat assessment of Mud Creek at MUDC-4 conducted May 2, 2012.

Habitat Assessment	% Max Score	Rating
Instream habitat quality	58	Marginal (41-58)
Sediment deposition	77	Optimal (>70)
Sinuosity	78	Sub-optimal (65-84)
Bank and vegetative stability	78	Optimal (>74)
Riparian buffer	39	Poor (<50)
<b>Habitat assessment score</b>	<b>158</b>	
<b>% Maximum score</b>	<b>66</b>	<b>Sub-optimal (59-70)</b>

### BIOASSESSMENT RESULTS

Benthic macroinvertebrate communities were sampled using ADEM's Intensive Multi-habitat Bioassessment methodology (WMB-I). The WMB-I measures 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 each metric score. Metric results indicated that the macroinvertebrate community to be in *poor* condition (Table 4).

**Table 4.** Results of the macroinvertebrate bioassessment conducted in Mud Creek at MUDC-4, May 2, 2012.

Macroinvertebrate Assessment		
	Results	Scores
<b>Taxa richness measures</b>		<b>(0-100)</b>
# EPT taxa	6	9
<b>Taxonomic composition measures</b>		
% Non-insect taxa	20	14
% Dominant taxon	22	70
% EPC taxa	9	14
<b>Functional feeding group measures</b>		
% Predators	7	26
<b>Tolerance measures</b>		
% Taxa as Tolerant	49	0
<b>WMB-I Assessment Score</b>	<b>---</b>	<b>22</b>
<b>WMB-I Assessment Rating</b>		<b>Poor (20-38)</b>

### WATER CHEMISTRY

Results of water chemistry analyses are summarized in Table 5. When possible, in situ measurements and water samples were collected monthly April through November 2012 to help identify any stressors to the biological communities. Median alkalinity, total dissolved solids, chloride, nitrate+nitrite nitrogen, total nitrogen, dissolved reactive phosphorus, and total phosphorus concentrations were higher than expected based on 90th percentile of all other streams within the 68d ecoregion. Specific conductance and hardness were higher when compared to the median of all other reference streams within the 68d ecoregion. In June, pH exceeded criteria applicable to Mud Creek's *F&W* use classification designation.

### SUMMARY

Mud Creek at MUDC-4 was sampled due to its previous *poor* macroinvertebrate ratings, as well as the non-point source influences within the reach. The combination of the recent *poor* macroinvertebrate rating despite the *sub-optimal* habitat assessment and the numerous elevated water chemistry parameters indicate that surface runoff might be negatively impacting the stream reach.

**Table 5.** Summary of water quality data collected April-November, 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
<b>Physical</b>							
Temperature (°C)	13	8.4	26.2	22.7	20.5	6.0	
Turbidity (NTU)	13	0.9	19.7	1.7	4.2	6.0	
Total Dissolved Solids (mg/L)	10	98.0	246.0	197.0 <sup>M</sup>	182.2	52.7	
Total Suspended Solids (mg/L)	10	< 1.0	5.0	0.5	2.0	2.0	
Specific Conductance (µmhos)	13	124.5	381.7	331.2 <sup>G</sup>	302.9	78.1	
Hardness (mg/L)	2	84.7	107.0	95.8 <sup>G</sup>	95.8	15.8	
Alkalinity (mg/L)	10	41.2	123.0	87.4 <sup>M</sup>	90.3	28.6	
Stream Flow (cfs)	11	0.4	17.4	0.7	2.6	5.0	
<b>Chemical</b>							
Dissolved Oxygen (mg/L)	13	6.8	13.0	11.8	10.6	2.1	
pH (su)	13	7.2	8.6 <sup>C</sup>	8.0	7.9	0.4	1
<sup>J</sup> Ammonia Nitrogen (mg/L)	10	< 0.007	0.026	0.004	0.008	0.008	
Nitrate+Nitrite Nitrogen (mg/L)	10	0.949	6.719	3.155 <sup>M</sup>	3.402	2.111	
Total Kjeldahl Nitrogen (mg/L)	10	0.290	0.791	0.452	0.469	0.133	
Total Nitrogen (mg/L)	10	1.381	7.510	3.548 <sup>M</sup>	3.871	2.203	
Dissolved Reactive Phosphorus (mg/L)	10	0.049	0.892	0.374 <sup>M</sup>	0.404	0.276	
Total Phosphorus (mg/L)	10	0.081	0.932	0.418 <sup>M</sup>	0.444	0.273	
<sup>J</sup> CBOD-5 (mg/L)	10	< 2.0	< 2.0	1.0	1.0	0.0	
Chlorides (mg/L)	10	4.9	26.3	18.2 <sup>M</sup>	17.6	7.1	
<b>Biological</b>							
Chlorophyll a (ug/L)	4	0.27	4.27	0.40	1.34	1.96	
E. coli (col/100mL)	7	8	172	35	49	58	

C=value exceeds established criteria for *F&W* water use classification; E=# samples that exceeded criteria; G=value higher than median concentration of all verified ecoregional reference reach data collected in the ecoregion 68d; M=value >90% of collected samples in ecoregion 68d; N= # of samples.

FOR MORE INFORMATION, CONTACT:  
James Worley, ADEM Aquatic Assessment Unit  
1350 Coliseum Boulevard Montgomery, AL 36110  
(334) 394-4343 jworley@adem.state.al.us