

# 2010 Monitoring Summary



## Mill Creek at Cherokee County Road 2 (33.97058/-85.60120)

### BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Mill Creek watershed for biological and water quality monitoring as part of the 2010 Alabama, Coosa, Tallapoosa (ACT) Basin Assessment. The objectives of the project were to assess the biological integrity of each monitoring site and to estimate overall water quality within the basin.



Figure 1. Downstream view of Mill Creek at MLLC-4, September 9, 2010.

### WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Mill Creek is a *Fish & Wildlife (F&W)* stream located a few miles north of the city of Piedmont in the Southern Limestone/Dolomite Valleys and Low Rolling Hills ecoregion (67f). Based on the 2006 National Land Cover Dataset, landuse within the watershed is predominantly forest (62%) with some pastures and urban development (14%). As of September 1, 2012, ADEM's NPDES Management System database shows a total of 13 permitted discharges within the 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. Mill Creek at MLLC-4 is a high-gradient, riffle-run stream with substrate composed primarily of bedrock (Figure 1). Overall habitat quality and availability was rated as *sub-optimal*. The reach was characterized by limited riparian buffers and unstable banks.

### 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 *fair* condition (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
<b>Basin</b>		Coosa River
<b>Drainage Area (mi<sup>2</sup>)</b>		23
<b>Ecoregion<sup>a</sup></b>		67f
<b>% Landuse</b>		
Open water		<1
Wetland	Woody	<1
Forest	Deciduous	21
	Evergreen	30
	Mixed	11
Shrub/scrub		3
Grassland/herbaceous		2
Pasture/hay		16
Cultivated crops		3
Development	Open space	8
	Low intensity	5
	Moderate intensity	1
	High intensity	<1
Barren		<1
<b>Population/km<sup>2b</sup></b>		118
<b># NPDES Permits<sup>c</sup></b>	<b>TOTAL</b>	13
	Construction Stormwater	9
	Industrial General	1
	Underground Injection Control	3

a. Southern Limestone/Dolomite Valleys and Low Rolling Hills

b. 2000 US Census

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

Table 2. Physical characteristics of Mill Creek at MLLC-4, May 27, 2010.

Physical Characteristics		
<b>Width (ft)</b>		30
<b>Canopy Cover</b>		Estimate 50/50
<b>Depth (ft)</b>		
	Riffle	0.5
	Run	1.5
	Pool	2.5
<b>% of Reach</b>		
	Riffle	5
	Run	85
	Pool	10
<b>% Substrate</b>		
	Bedrock	80
	Boulder	1
	Cobble	3
	Gravel	3
	Sand	3
	Silt	3
	Organic Matter	7

**Table 3.** Results of the habitat assessment conducted on Mill Creek at MLLC-4, May 27, 2010.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	73	Optimal >70
Sediment Deposition	88	Optimal >70
Sinuosity	90	Optimal >84
Bank and Vegetative Stability	51	Marginal (35-59)
Riparian Buffer	48	Poor <50
<b>Habitat Assessment Score</b>	<b>167</b>	
<b>% Maximum Score</b>	<b>70</b>	<b>Sub-optimal (59-70)</b>

**Table 4.** Results of the macroinvertebrate bioassessment conducted in Mill Creek at MLLC-4, May 27, 2010.

Macroinvertebrate Assessment		
	Results	Scores (0-100)
<b>Taxa richness and diversity measures</b>		
# EPT taxa	22	78
Shannon Diversity	3.76	49
<b>Taxonomic composition measures</b>		
% EPT minus Baetidae and Hydropsychidae	44	47
% Non-insect taxa	21	11
<b>Tolerance measures</b>		
% Tolerant taxa	27	62
<b>WMB-I Assessment Score</b>	<b>---</b>	<b>50</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 bi-monthly May through November of 2010 to help identify any stressors to the biological communities.

Organics were collected at MLLC-4 on May 5th and September 9th, but all parameters were below detection limits. Median concentrations of nitrate+nitrite nitrogen and dissolved manganese were higher than expected for ecoregion 67f. Median specific conductance and hardness were higher than background levels for ecoregion 67f. Copper exceeded aquatic life use criteria on one of four occasions.

## SUMMARY

Bioassessment results indicated the macroinvertebrate community to be in *fair* condition. Overall habitat quality was categorized as *sub-optimal* due to a poor riparian buffer and unstable banks. Conductivity, hardness, nitrate+nitrite nitrogen, copper, and dissolved manganese were higher than expected for ecoregion 67f. Monitoring should continue to ensure that water quality and biological conditions remain stable.

FOR MONITORING INFORMATION, CONTACT:  
Alicia K. Phillips ADEM Environmental Indicators Section  
1350 Coliseum Boulevard Montgomery, AL 36110  
(334) 260-2797 akphillips@adem.state.al.us

**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
<b>Physical</b>							
Temperature (°C)	5	12.2	23.4	20.0	19.5	4.5	
Turbidity (NTU)	5	1.8	17.2	8.9	9.7	5.8	
Total Dissolved Solids (mg/L)	4	100.0	132.0	117.0	116.5	14.3	
Total Suspended Solids (mg/L)	4	3.0	5.0	3.5	3.8	1.0	
Specific Conductance (µmhos)	5	149.3	249.6	233.2 <sup>G</sup>	222.1	41.4	
Hardness (mg/L)	4	66.1	118.0	114.0 <sup>G</sup>	103.0	24.7	
Alkalinity (mg/L)	4	69.5	126.0	121.0	109.4	26.7	
Stream Flow (cfs)	5	2.7	31.1	7.0	10.2	11.9	
<b>Chemical</b>							
Dissolved Oxygen (mg/L)	5	7.6	8.6	7.8	8.0	0.5	
pH (su)	5	7.4	7.8	7.6	7.6	0.2	
<sup>J</sup> Ammonia Nitrogen (mg/L)	4	< 0.021	< 0.021	0.010	0.010	0.000	
<sup>J</sup> Nitrate+Nitrite Nitrogen (mg/L)	4	0.100	240.000	0.320 <sup>M</sup>	60.185	119.877	
<sup>J</sup> Total Kjeldahl Nitrogen (mg/L)	4	< 0.080	0.452	0.098	0.172	0.194	
<sup>J</sup> Total Nitrogen (mg/L)	4	< 0.140	240.040	0.624	60.357	119.789	
<sup>J</sup> Dissolved Reactive Phosphorus (mg/L)	4	0.007	0.018	0.014	0.013	0.005	
<sup>J</sup> Total Phosphorus (mg/L)	4	0.020	0.023	0.020	0.021	0.001	
CBOD-5 (mg/L)	4	< 2.0	< 2.0	1.0	1.0	0.0	
Chlorides (mg/L)	4	1.9	2.6	2.3	2.3	0.3	
Atrazine (µg/L)	2	< 0.02	< 0.02	0.01	0.01	0.00	
<b>Total Metals</b>							
<sup>J</sup> Aluminum (mg/L)	4	< 0.033	0.318	0.088	0.127	0.132	
Iron (mg/L)	4	0.205	0.531	0.233	0.300	0.155	
<sup>J</sup> Manganese (mg/L)	4	0.042	0.101	0.058	0.065	0.028	
<b>Dissolved Metals</b>							
Aluminum (mg/L)	4	< 0.033	< 0.043	0.016	0.018	0.002	
Antimony (µg/L)	4	< 1.9	< 1.9	0.9	0.9	0.0	
Arsenic (µg/L)	4	< 0.4	< 2.1	1.0	0.8	0.4	
Cadmium (mg/L)	4	< 0.000	< 0.014	0.001	0.002	0.003	
<sup>J</sup> Chromium (mg/L)	4	< 0.009	0.022	0.006	0.010	0.008	
<sup>J</sup> Copper (mg/L)	4	< 0.013	0.021 <sup>S</sup>	0.008	0.011	0.007	1
<sup>J</sup> Iron (mg/L)	4	< 0.026	0.098	0.028	0.042	0.038	
Lead (µg/L)	4	< 1.7	< 1.7	0.8	0.8	0.0	
<sup>J</sup> Manganese (mg/L)	4	< 0.001	0.085	0.028 <sup>M</sup>	0.035	0.036	
Mercury (µg/L)	4	< 0.1	< 0.1	0.0	0.0	0.0	
Nickel (mg/L)	4	< 0.019	< 0.042	0.010	0.012	0.006	
<sup>J</sup> Selenium (µg/L)	4	< 1.7	1.7	0.8	1.1	0.4	
Silver (mg/L)	4	< 0.000	< 0.002	0.000	0.000	0.001	
Thallium (µg/L)	4	< 0.6	< 0.6	0.3	0.3	0.0	
Zinc (mg/L)	4	< 0.012	< 0.030	0.015	0.013	0.004	
<b>Biological</b>							
Chlorophyll a (ug/L)	4	0.27	2.14	0.80	1.00	0.83	
E. coli (col/100mL)	4	205	435	261	290	100	

E=# samples that exceeded criteria; G=value higher than median concentration of all verified ecoregional reference reach data collected in the ecoregion 67f; J=estimate; M=value >90% of all verified ecoregional reference reach data collected in the ecoregion 67f; N=# samples; S=F&W harness-adjusted aquatic life use criteria exceeded.