2008 Monitoring Summary

™
Poor

Mill Creek at Broad St in Phenix City (Russell County) (32.46560/-85.00078)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Mill Creek watershed for biological and water quality monitoring as part of the 2008 South East Alabama (SE-AL) Basin Assessment Monitoring Program. The objectives of the SE-AL Basin Assessments were to assess the biological integrity of each monitoring site and to estimate overall water quality within the SEAL basin group.

Mill Creek from Chattahoochee River to its source was placed on Alabama's Clean Water Act (CWA) 2006 §303(d) list of impaired waters for not meeting its Fish and Wildlife (F&W) water use classification. It was listed for unknown impairment from unknown sources. Sampling was conducted in 2008 to identify the causes and sources of impairment.

Figure 1. Reach Characteristics of the Mill Creek watershed at MICR-1.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Mill Creek is a Fish and Wildlife (F&W) stream located in Russell County. Based on the 2000 National Land Cover Dataset, land cover within the watershed is 51% development and 30% forest. A total of one hundred and fifty nine permits have been issued in the watershed as of February 23, 2011. Population density is relatively high.

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 MICR-1 is a shallow, medium-gradient stream reach located in the Fall Line Hills (65i) ecoregion (Figure 1). Overall habitat quality as *sub-optimal* for supporting macroinvertebrate communities.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Chattahoochee River
Drainage Area (mi^2)		24
Ecoregion[a]		65i
% Landuse		
Open water		<1
Wetland	Woody	2
Forest	Deciduous	13
	Evergreen	10
	Mixed	7
Shrub/scrub		9
Grassland/herbaceous		<1
Pasture/hay		5
Cultivated crops		2
Development	Open space	24
	Low intensity	18
	Moderate intensity	7
	High intensity	2
Barren		<1
Population/km^2 [b]		683
# NPDES Permits[c]	**TOTAL**	159
Construction Stormwater		154
Industrial General		4
Municipal Individual		1

a. Fall Line Hills
b. 2000 US Census
c. #NPDES permits downloaded from ADEM's NPDES Management System database, February 23, 2011.

Table 2. Physical characteristics of Mill Creek at MICR-1, June 10, 2008.

Physical Characteristics	
Width (ft)	25
Canopy Cover	Mostly Shaded
Depth (ft)	
Riffle	0.5
Run	1.3
Pool	1.5
% of Reach	
Riffle	20
Run	60
Pool	20
% Substrate	
Bedrock	20
Boulder	3
Cobble	15
Gravel	10
Sand	40
Silt	9
Organic Matter	3

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 scores for each individual metric. Metric results indicated the macroinvertebrate community to be characterized by pollution-tolerant taxa groups, indicating *poor* community condition (Table 4).

Table 3. Results of the habitat assessment conducted on Mills Creek at MICR-1, June 10, 2008.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	58	Sub-optimal (53-65)
Sediment Deposition	58	Sub-optimal (53-65)
Sinuosity	58	Marginal (45-64)
Bank and Vegetative Stability	48	Marginal <35-59)
Riparian Buffer	74	Sub-optimal (70-89)
Habitat Assessment	**139**	
% Maximum Score	**58**	**Sub-optimal (53-65)**

Table 4. Results of macroinvertebrate bioassessment conducted in Mill Creek at MICR-1, June 10, 2008.

Macroinvertebrate Assessment			
	Results	Scores	Rating
Taxa richness measures		**(0-100)**	
# Ephemeroptera (mayfly) genera	2	17	Very Poor (<23)
# Plecoptera (stonefly) genera	0	0	Very Poor (<16)
# Trichoptera (caddisfly) genera	3	25	Poor (22-44)
Taxonomic composition measures			
% Non-insect taxa	17	31	Poor (24.7-49.4)
% Non-insect organisms	2	96	Good (94-97)
% Plecoptera	0	0	Very Poor (<6.56)
Tolerance measures			
Beck's community tolerance index	0	0	Very Poor (<20.2)
WMB-I Assessment Score	**--**	**24**	**Poor (24-48)**

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. In situ measurements and water samples were collected monthly (chemical analyses and metals) during April through November of 2008 to help identify any stressors to the biological communities. Median values of alkalinity, hardness, conductivity and chlorides were higher than background levels based on least impaired reference reach data collected in ecoregion/subecoregion 65i. Atrazine was detected in the sample collected on May 13, 2008. No other pesticides or semi volatile organics were detected.

SUMMARY

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

Bioassessment results indicated an impaired macroinvertebrate community. Higher than expected specific conductance, alkalinity, hardness and chlorides suggest urban/industrial influences.

Table 5. Summary of water quality data collected April-November, 2008. 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	Q
Physical								
Temperature (°C)	9		12.0	26.2	23.3	21.3	4.7	
Turbidity (NTU)	9		3.9	94.5	8.7	20.0	28.6	
Total Dissolved Solids (mg/L)	8		20.0	118.0	58.0	59.0	36.2	
Total Suspended Solids (mg/L)	8		1.0	28.0	6.0	8.9	8.1	
Specific Conductance (µmhos)	9		73.0	149.7	125.8 G	118.8	25.1	
Hardness (mg/L)	7		21.3	48.0	37.5 G	34.5	9.7	
Alkalinity (mg/L)	8		14.5	46.8	37.0 M	33.7	10.7	
Stream Flow (cfs)	8		0.8	36.7	3.6	10.6	13.1	
Chemical								
Dissolved Oxygen (mg/L)	9		7.0	10.5	8.0	8.3	1.1	
pH (su)	9		6.6	7.4	7.1	7.1	0.2	
Ammonia Nitrogen (mg/L)	8	<	0.014	0.023	0.008	0.009	0.006	
Nitrate+Nitrite Nitrogen (mg/L)	8		0.081	0.383	0.198	0.209	0.084	
Total Kjeldahl Nitrogen (mg/L)	8	<	0.150	0.520	0.292	0.285	0.137	
Total Nitrogen (mg/L)	8	<	0.273	0.732	0.462	0.494	0.165	
Dissolved Reactive Phosphorus (mg/L)	8		0.009	0.025	0.020	0.018	0.006	
Total Phosphorus (mg/L)	8		0.032	0.052	0.036	0.039	0.008	
CBOD-5 (mg/L)	8	<	1.0	2.7	0.5	0.9	0.8	
Chlorides (mg/L)	8		5.7	10.9	8.2 M	8.3	1.7	
Atrazine (µg/L)	1					0.29		
Total Metals								
Aluminum (mg/L)	7	<	0.015	0.688	0.067	0.227	0.260	J
Iron (mg/L)	7		0.287	1.790	0.706	0.852	0.530	
Manganese (mg/L)	7		0.043	0.092	0.069	0.067	0.017	J
Dissolved Metals								
Aluminum (mg/L)	7	<	0.015	0.019	0.008	0.008	0.001	
Antimony (µg/L)	7	<	2.0 <	2.0	1.0	1.0	0.0	
Arsenic (µg/L)	7	<	1.6	2.2	1.1	1.1	0.1	
Cadmium (mg/L)	7	<	0.003	0.005	0.002	0.002	0.000	
Chromium (mg/L)	7	<	0.004	0.013	0.002	0.003	0.002	
Copper (mg/L)	7	<	0.005	0.013	0.002	0.004	0.002	
Iron (mg/L)	7		0.108	0.897	0.259	0.333	0.283	
Lead (µg/L)	7	<	0.6	1.5	0.7	0.7	0.2	
Manganese (mg/L)	7		0.027	0.089	0.061	0.058	0.020	J
Mercury (µg/L)	7	<	0.0	0.1	0.0	0.0	0.0	
Nickel (mg/L)	7	<	0.004	0.018	0.003	0.005	0.006	J
Selenium (µg/L)	7	<	1.5	1.6	0.8	0.8	0.0	
Silver (mg/L)	7	<	0.002	0.003	0.002	0.001	0.000	
Thallium (µg/L)	7	<	0.5	0.6	0.3	0.3	0.0	
Zinc (mg/L)	7	<	0.003	0.015	0.003	0.004	0.005	J
Biological								
Chlorophyll a (ug/L)	3		1.60	6.68	2.14	3.47	2.79	
Fecal Coliform (col/100 mL)	8		83	1,700	445	539	527	J

J=estimate; N=# samples; Q=qualifier; M=value > 90% of ADEM's verified reference reaches collected in ecoregions 65i; G=value higher than median concentration of all verified ecoregional reference reach data collected in the ecoregion (65i).