

2008 Monitoring Summary



Basin Assessment Site

Mill Creek at Lee Road 246 (32.51223/-85.08752)

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 SE-AL river basins.

Mill Creek 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. Results from these data may also be used in determining the biological and water quality criteria and Total Maximum Daily Load (TMDL) needs and priorities.



Figure 1. Reach Characteristics of Mill Creek watershed at MICR-2.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Mill Creek is a small [Fish and Wildlife \(F&W\)](#) stream located in Lee County. Based on the 2000 National Land Cover Dataset, landuse within the watershed is primarily forest (32%), with some patches of shrubs/scrub, pasture, and cultivated crops. Development accounted for 28% of the landuse. There are five permitted discharges located 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 MICR-2 is a shallow, low-gradient stream reach characterized by sand and gravel substrates (Figure 1). Overall habitat quality was categorized as *optimal* for supporting macroinvertebrate communities. However, the reach was also characterized by unstable banks and marginal riparian buffer, which contributes to impacts from sedimentation and scouring and minimizes available habitat for aquatic life to populate.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin	Chattahoochee River	
Drainage Area (mi ²)	2	
Ecoregion ^a	65i	
% Landuse		
Open water		1
Wetland	Woody	<1
Forest	Deciduous	19
	Evergreen	6
	Mixed	7
Shrub/scrub		14
Pasture/hay		11
Cultivated crops		13
	Development	13
	Open space	13
	Low intensity	9
	Moderate intensity	4
	High intensity	2
Population/km ² ^b		137
# NPDES Permits ^c	TOTAL	5
	Construction Stormwater	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-2, June 10, 2008.

Physical Characteristics		
Width (ft)	6	
Canopy Cover	Mostly Shaded	
Depth (ft)	Riffle	0.2
	Run	0.5
	Pool	1.0
% of Reach	Riffle	5
	Run	5
	Pool	90
% Substrate	Cobble	1
	Gravel	20
	Sand	70
	Silt	7
	Organic Matter	2

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 the score for each individual metric. Metric results indicated the macroinvertebrate community to be in *very poor* condition (Table 4).

Table 3. Results of the habitat assessment conducted on Mills Creek at MICR-2, June 10, 2008.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	79	Optimal >65
Sediment Deposition	65	Sub-optimal (53-65)
Sinuosity	100	Optimal >84
Bank and Vegetative Stability	51	Marginal (35-59)
Riparian Buffer	63	Marginal (50-69)
Habitat Assessment Score	163	
% Maximum Score	68	Optimal >65

Table 4. Results of macroinvertebrate bioassessment conducted in Mill Creek at MICR-2, June 10, 2008.

Macroinvertebrate Assessment			
	Results	Scores	Rating
Taxa richness measures		(0-100)	
# Ephemeroptera (mayfly) genera	1	8	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	20	18	Very Poor (<24.7)
% Non-insect organisms	18	52	Poor (31.3-62.7)
% Plecoptera	0	0	Very Poor (<6.56)
Tolerance measures			
Beck's community tolerance index	2	7	Very Poor (<20.2)
WMB-I Assessment Score	--	16	Very Poor (<24)

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. [In situ measurements](#) and [water samples](#) were collected monthly during April through November of 2008 to help identify any stressors to the biological communities. Dissolved oxygen was below the established criteria for [F&W](#) use classification in July and August. This could be due to the minimum flow in July and no flow conditions in August. Median concentrations of alkalinity, specific conductance, hardness, chlorides and dissolved iron were higher than expected based on the reference reach data collected in ecoregion/subcoregion 65i.

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. Low dissolved oxygen concentrations, specific conductance, alkalinity, hardness and chlorides may contribute to the degraded biological conditions. Specific conductance, alkalinity, hardness and chlorides suggest urban/industrial influences as potential sources of these stressors.

Table 5. Summary of water quality data collected March-October, 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	E
Physical								
Temperature (°C)	8	12.5	26.0	22.3	21.6	4.5		
Turbidity (NTU)	8	5.5	34.7	11.8	13.4	9.4		
Total Dissolved Solids (mg/L)	8	< 1.0	130.0	39.0	48.6	40.1		
Total Suspended Solids (mg/L)	8	< 1.0	58.0	6.5	12.3	18.9		
Specific Conductance (µmhos)	8	72.8	124.8	113.4 ^G	103.5	22.1		
Hardness (mg/L)	7	21.6	44.2	24.5 ^G	29.3	8.7		
Alkalinity (mg/L)	8	14.9	45.6	38.2 ^M	33.8	12.7		
Stream Flow (cfs)	5	0.2	2.8	1.0	1.3	1.1		
Chemical								
Dissolved Oxygen (mg/L)	8	3.5 ^C	8.3	5.9	6.2	1.7	2	
pH (su)	8	6.4	6.8	6.5	6.5	0.1		
Ammonia Nitrogen (mg/L)	8	0.024	0.113	0.036	0.045	0.029		
Nitrate+Nitrite Nitrogen (mg/L)	8	0.060	0.176	0.132	0.129	0.039		
Total Kjeldahl Nitrogen (mg/L)	8	< 0.150	0.689	0.350	0.380	0.204		
Total Nitrogen (mg/L)	8	< 0.165	0.861	0.448	0.509	0.230		
Dissolved Reactive Phosphorus (mg/L)	8	0.007	0.015	0.011	0.011	0.002		
Total Phosphorus (mg/L)	8	0.020	0.066	0.032	0.039	0.016		
CBOD-5 (mg/L)	8	< 1.0	3.1	0.5	1.0	0.9		
Chlorides (mg/L)	8	5.4	10.5	8.0 ^M	7.8	1.8		
Total Metals								
Aluminum (mg/L)	7	0.021	0.288	0.074	0.095	0.090	J	
Iron (mg/L)	7	1.140	3.010	1.960	1.886	0.743		
Manganese (mg/L)	7	0.168	0.590	0.302	0.343	0.162		
Dissolved Metals								
Aluminum (mg/L)	7	< 0.015	0.077	0.010	0.020	0.026		
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	0.269	1.460	1.130 ^M	0.929	0.497		
Lead (µg/L)	7	< 0.6	1.5	0.7	0.7	0.2		
Manganese (mg/L)	7	0.149	0.528	0.273	0.314	0.147		
Mercury (µg/L)	7	< 0.0	0.1	0.0	0.0	0.0		
Nickel (mg/L)	7	< 0.004	0.016	0.003	0.005	0.005	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	0.006	0.003	0.003	0.001	J	
Biological								
Fecal Coliform (col/100 mL)	8	21	320	120	133	95	J	

E=# samples that exceeded criteria; J=estimate; N=# samples; Q=qualifier; M=value > 90% of ADEM's verified reference reaches collected in ecoregions 65i; C=value exceeds established criteria for [F&W](#) water use classification; G=value higher than median of all verified ecoregional reference reach data collected in ecoregion (65i).

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