

2008 Monitoring Summary



Mill Creek at U.S. Highway 280 in Russell County (32.48897/-85.03400)

BACKGROUND

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 for impairment from unknown causes due to unknown sources. To investigate the cause and source of impairment, the Alabama Department of Environmental Management (ADEM) monitored Mill Creek at CHA-2 in 2008. Macroinvertebrate and habitat assessments were conducted to verify impairment to aquatic communities. Monthly water chemistry samples were collected to identify the cause of impairment. Results from these data may also be used in the determination of Total Maximum Daily Load (TMDL) needs and priorities.



Figure 1. Mill Creek at CHA-2.

WATERSHED CHARACTERISTICS

Mill Creek at CHA-2 is located within the Fall Line Hills subcoregion of the Southeastern Plains in Russell County. Based on the 2000 National Land-cover Dataset (NLCD), landuse within the watershed was composed primarily of developed (42%) and forested areas (31%), with some shrub/scrub (Table 1). As of February 23, 2011, the ADEM has issued 71 NPDES permits, 70 of which are related to construction stormwater activities.

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 CHA-2 is a small, mostly-shaded stream reach (Figure 1). This reach was characterized by a predominantly sand substrate with cobble and gravel present. Pools, which are deeper areas with lower velocities, comprised 70 percent of the stream reach. Overall habitat quality was categorized as *marginal*.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin	Chattahoochee River	
Drainage Area (mi ²)	12	
Ecoregion ^a	65i	
% Landuse		
Open water		1
Wetland	Woody	3
Forest	Deciduous	15
	Evergreen	8
	Mixed	8
Shrub/scrub		12
Grassland/herbaceous		<1
Pasture/hay		5
Cultivated crops		4
Development	Open space	22
	Low intensity	15
	Moderate intensity	4
	High intensity	1
Barren		<1
Population/km ^{2b}	267	
# NPDES Permits ^c	TOTAL	71
	Construction Stormwater	70
	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 CHA-2, June 10, 2008.

Physical Characteristics		
Width (ft)	10	
Canopy Cover	Mostly Shaded	
Depth (ft)		
	Riffle	0.1
	Run	0.5
	Pool	1.5
% of Reach		
	Riffle	10
	Run	20
	Pool	70
% Substrate		
	Boulder	5
	Cobble	15
	Gravel	5
	Sand	68
	Silt	5
	Organic Matter	2

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

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	43	Marginal (40-52)
Sediment Deposition	44	Marginal (40-52)
Sinuosity	55	Marginal (45-64)
Bank and Vegetative Stability	53	Marginal (35-59)
Riparian Buffer	50	Marginal (50-69)
Habitat Assessment Score	111	
% Maximum Score	46	Marginal (40-52)

Table 4. Results of the macroinvertebrate bioassessment conducted in CHA-2, June 10, 2008.

Macroinvertebrate Assessment			
	Results	Scores	Rating
Taxa richness measures		(0-100)	
# Ephemeroptera (mayfly) genera	3	25	Poor (23-46)
# Plecoptera (stonefly) genera	0	0	Very Poor (<16)
# Trichoptera (caddisfly) genera	5	42	Poor (22-44)
Taxonomic composition measures			
% Non-insect taxa	12	52	Fair (49.5-74.1)
% Non-insect organisms	1	96	Good (94-97)
% Plecoptera	0	0	Very Poor (<6.56)
Tolerance measures			
Beck's community tolerance index	3	11	Very Poor (<20.2)
WMB-I Assessment Score	--	32	Poor (24-48)

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 to be in *poor* condition (Table 4). Very few pollution-intolerant taxa were collected at the site.

WATER CHEMISTRY

[In situ measurements](#) and [water samples](#) were collected monthly during April through November of 2008 to help identify any stressors to the biological communities. Water chemistry results are summarized in Table 5. Median specific conductance and hardness were higher than the median concentration of all verified ecoregional reference reach data collected in ecoregion 65i. Median alkalinity, chlorides and dissolved iron values were higher than the 90th percentile of data collected at reference reaches in ecoregion 65i. Stream flow was characterized as visible, but not detectable during May, June, July and October.

SUMMARY

As part of the [assessment process](#), ADEM will review the monitoring information presented in this report, along with all other available data. Mill Creek was placed on Alabama's Clean Water Act (CWA) [2006 §303\(d\) list](#) of impaired waters for not meeting its *F&W* water use classification due to unknown impairment from unknown sources. Results of the 2008 bioassessment indicated the macroinvertebrate community in Mill Creek at CHA-2 to be in *poor* condition, verifying impairment to biological communities potentially caused by organic enrichment. The 2010 §303(d) list further clarifies by specifying the issue of concern as organic enrichment due to urban development.

Table 5. Summary of water quality data collected March-October, 2007. 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	Q
Physical							
Temperature (°C)	9	12.6	26.6	23.7	21.5	4.6	
Turbidity (NTU)	9	15.3	48.7	16.8	21.1	10.6	
Total Dissolved Solids (mg/L)	8	20.0	216.0	53.0	75.0	64.3	
Total Suspended Solids (mg/L)	8	1.0	26.0	6.0	10.2	9.5	
Specific Conductance (µmhos)	9	76.3	210.6	132.4 ^G	139.7	50.2	
Hardness (mg/L)	7	22.7	69.8	36.1 ^G	42.7	16.0	
Alkalinity (mg/L)	8	15.2	77.2	41.0 ^M	44.5	23.1	
Stream Flow (cfs)	4	0.3	16.0	8.2	8.2	7.9	
Chemical							
Dissolved Oxygen (mg/L)	9	5.8	9.7	7.1	7.6	1.4	
pH (su)	9	6.5	7.7	7.0	7.0	0.4	
Ammonia Nitrogen (mg/L)	8	< 0.014	0.040	0.012	0.019	0.014	
Nitrate+Nitrite Nitrogen (mg/L)	8	0.006	0.113	0.065	0.056	0.034	
Total Kjeldahl Nitrogen (mg/L)	8	< 0.150	0.663	0.306	0.356	0.212	
Total Nitrogen (mg/L)	8	< 0.144	0.734	0.344	0.413	0.225	
Dissolved Reactive Phosphorus (mg/L)	8	0.008	0.117	0.021	0.037	0.037	
Total Phosphorus (mg/L)	8	0.026	0.273	0.065	0.112	0.092	
CBOD-5 (mg/L)	8	< 1.0	4.7	0.8	1.2	1.4	
Chlorides (mg/L)	8	6.1	10.5	8.6 ^M	8.7	1.4	
Total Metals							
Aluminum (mg/L)	7	0.044	0.779	0.108	0.201	0.258 ^J	
Iron (mg/L)	7	1.770	4.390	3.140	2.929	0.943	
Manganese (mg/L)	7	0.240	0.453	0.417	0.368	0.089	
Dissolved Metals							
Aluminum (mg/L)	7	< 0.015	0.055	0.008	0.015	0.018	
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	0.317	1.520	0.579 ^M	0.782	0.477	
Lead (µg/L)	7	< 0.6	1.5	0.7	0.7	0.2	
Manganese (mg/L)	7	0.220	0.418	0.390	0.344	0.085	
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	0.008	0.003	0.004	0.002 ^J	
Biological							
Fecal Coliform (col/100 mL)	8	20	780	99	183	251 ^J	

J=estimate; M=value >90% of all verified ecoregional reference reach data collected in the ecoregion 65i; G=value higher than median concentration of all verified ecoregional reference reach data collected in ecoregion 65i; N=# samples.

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