Alabama Department of Environmental Management

§303(d)/TMDL Monitoring Site

Rivers and Streams Monitoring Program

2007 Monitoring Summary

Very Poor

Fivemile Creek on Central Avenue in Jefferson County (33.58654, -86.79341)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) monitored Fivemile Creek at FMCJ-3 and several other locations for possible impacts from added discharges from Sloss Industries and ABC Polymer Industries. Results from monthly water sampling events may be used in determining TMDL needs and priorities. In addition to water samples, macroinvertebrate and habitat assessments were also conducted to verify any impairment to the aquatic communities.

Figure 1. Fivemile Creek at FMCJ-3.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Black Warrior River
Drainage Area (mi^2)		30
Ecoregion[a]		68f
% Landuse		
Open water		1
Wetland	Woody	<1
Forest	Deciduous	18
	Evergreen	5
	Mixed	3
Shrub/scrub		1
Grassland/herbaceous		1
Pasture/hay		1
Cultivated crops		<1
Development	Open space	35
	Low intensity	22
	Moderate intensity	7
	High intensity	3
Barren		2
Population/km^2[b]		717
# NPDES Permits[c]	**TOTAL**	55
401 Water Quality Certification		2
Construction Stormwater		19
Mining		3
Industrial		29
Municipal Individual		7

a. Shale Hills

b. 2000 US Census

c. #NPDES permits downloaded from ADEM's NPDES Management System database, February 23, 2011

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Fivemile Creek at FMCJ-3 is a *Fish and Wildlife (F&W)* stream in Jefferson County, 0.5 miles downstream of the Sloss discharge. Based on the 2000 National Land Cover Dataset landuse, the watershed is primarily development (65%). Population density is relatively high within the watershed. As of February 23, 2011, 118 permitted discharges have been issued 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. Fivemile Creek at FMCJ-3 is characterized by cobble and gravel substrates (Figure 1). Overall habitat quality was categorized as *sub-optimal* for supporting macroinvertebrate communities. However, much of the riparian area within this reach was developed.

Table 2. Physical characteristics of Fivemile Creek at FMCJ-3, May 29, 2007.

Physical Characteristics		
Width (ft)		35
Canopy cover		Open
Depth (ft)		
	Riffle	0.3
	Run	1
	Pool	1.5
% of Reach		
	Riffle	40
	Run	40
	Pool	20
% Substrate		
	Bedrock	2
	Boulder	15
	Cobble	35
	Gravel	38
	Sand	1
	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 all individual metric scores. Metric results indicated the macroinvertebrate community to be characterized by pollution-tolerant taxa groups, indicating *very poor* community condition (Table 4).

Table 3. Results of the habitat assessment conducted in Fivemile Creek at FMCJ-3, May 29, 2007.

Habitat Assessment	% Maximum Score	Rating
Instream Habitat Quality	76	Optimal (> 70)
Sediment Deposition	63	Sub-optimal (59-70)
Sinuosity	90	Optimal (> 84)
Bank and Vegetative Stability	66	Sub-optimal (60-74)
Riparian Buffer	49	Poor (<50)
Habitat Assessment Score	**164**	
% Maximum score	**68**	**Sub-optimal (59-70)**

Table 4. Results of the macroinvertebrate bioassessment conducted in Fivemile Creek at FMCJ-3, May 29, 2009

Macroinvertebrate Assessment Results			
	Results	**Scores (0-100)**	**Rating**
Taxa richness measures			
# Ephemeroptera (mayfly) genera	3	25	Poor (23-46)
# Plecoptera (stonefly) genera	0	0	Very Poor (<16)
# Trichoptera (caddisfly) genera	3	25	Poor (22-44)
Taxonomic composition measures			
% Non-insect taxa	32	0	Very Poor (<24.7)
% Non-insect organisms	47	0	Very Poor (<31.3)
% Plecoptera	0	0	Very Poor (<6.56)
Tolerance measures			
Beck's community tolerance index	3	11	Very Poor (<20.2)
WMB-I Assessment Score	**---**	**9**	**Very Poor (<24)**

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. In situ measurements and water samples were collected monthly, semi-monthly or quarterly (pesticides, herbicides, atrazine, and semi-volatile organics) during March through October of 2007 to help identify any stressors to the biological communities. Arsenic values exceeded its *F&W* use classification human health criterion during all sampling events. Based on the 90th percentile of reference reach data collected in ecoregion 67f, median concentrations of total dissolved solids, nutrients (ammonia nitrogen, nitrate+nitrite-nitrogen, total kjeldahl nitrogen, total nitrogen, dissolved reactive phosphorus, and total phosphorus) and chlorides were above concentrations expected in this ecoregion.

SUMMARY

As part of the assessment process, ADEM will review the monitoring information presented in this report along with other available data to develop water quality criteria for Shale Hills ecoregion (68f).

Results of the habitat assessment indicated the habitat of Fivemile Creek at FMCJ-3 to be in *sub-optimal* condition. However, the bioassessment indicated the macroinvertebrate community to be in *very poor* condition. Elevated concentrations of arsenic, total dissolved solids, chlorides and nutrients are potential causes for the stressed biological conditions. The large amount of development (65%), permitted discharges (118), and limited riparian buffer within this watershed suggest urban/industrial influences as potential sources of these stressors.

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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 this value.

Parameter	N	Min	Max	Med	Avg	SD	E
Physical							
Temperature (°C)	17	16.6	28.5	25.3	25.0	3.4	
Turbidity (NTU)	17	2.6	28.3	6.4	9.5	7.4	
Total Dissolved Solids (mg/L)	8	301.0	449.0	387.5 M	384.5	45.6	
Total Suspended Solids (mg/L)	8	3.0	16.0	5.5	6.8	4.2	
Specific Conductance (µmhos)	17	488.0	897.0	620.0	676.3	123.9	
Hardness (mg/L)	8	185.0	224.0	199.5	202.4	14.2	
Alkalinity (mg/L)	8	115.4	170.3	140.7	138.3	18.4	
Stream Flow (cfs)	17	14.2	30.1	24.6	23.6	4.0	
Chemical							
Dissolved Oxygen (mg/L)	17	7.1	13.1	8.0	8.4	1.4	
pH (su)	17	7.6	8.3	7.9	7.9	0.2	
Ammonia Nitrogen (mg/L)	8	0.075	0.335	0.262 M	0.237	0.096	
Nitrate+Nitrite Nitrogen (mg/L)	8	1.265	2.730	1.914 M	1.947	0.452	
J Total Kjeldahl Nitrogen (mg/L)	8	0.293	1.850	0.740 M	0.856	0.520	
J Total Nitrogen (mg/L)	8	2.022	3.640	2.868 M	2.803	0.556	
Dissolved Reactive Phosphorus (mg/L)	8	0.020	0.166	0.058 M	0.066	0.044	
J Total Phosphorus (mg/L)	8	< 0.006	0.222	0.078 M	0.096	0.070	
CBOD-5 (mg/L)	8	< 0.2	2.3	0.5	0.8	0.7	
Chlorides (mg/L)	8	20.1	55.6	28.4 M	33.9	13.9	
Atrazine (µg/L)	4	< 0.05	0.11	0.02	0.05	0.04	
Total Metals							
Aluminum (mg/L)	8	0.068	0.901	0.265	0.365	0.310	
Iron (mg/L)	8	< 0.050	0.361	0.166	0.160	0.099	
Manganese (mg/L)	8	< 0.046	0.064	0.049	0.046	0.014	
Dissolved Metals							
Aluminum (mg/L)	8	< 0.050	0.899	0.025	0.307	0.393	
Antimony (µg/L)	8	< 10.0	< 10.0	5.0	5.0	0.0	
Arsenic (µg/L)	8	2.0	3.6 H	3.1	3.0	0.6	8
Cadmium (mg/L)	8	< 0.002	< 0.015	0.004	0.004	0.004	
Chromium (mg/L)	8	< 0.002	< 0.050	0.013	0.013	0.013	
Copper (mg/L)	8	< 0.007	< 0.050	0.020	0.016	0.010	
Iron (mg/L)	8	< 0.014	< 0.050	0.025	0.024	0.005	
Lead (µg/L)	8	< 0.5	< 2.0	0.2	0.5	0.3	
Manganese (mg/L)	8	< 0.020	0.036	0.010	0.018	0.012	
Mercury (µg/L)	8	< 0.010	< 0.010	0.005	0.005	0.000	
Nickel (mg/L)	8	< 0.002	< 0.050	0.013	0.013	0.013	
Selenium (µg/L)	8	1.8	4.6	3.2	3.2	1.0	
Silver (mg/L)	8	< 0.005	< 0.050	0.002	0.011	0.012	
Thallium (µg/L)	8	< 0.7	< 1.0	0.4	0.4	0.1	
Zinc (mg/L)	8	< 0.017	< 0.050	0.017	0.017	0.009	
Biological							
J Fecal Coliform (col/100 mL)	16	4	270	53	73	68	

E=# of samples that exceeded criteria; H=*F&W* human health criterion exceeded; J=estimate; M=value >90% of all verified ecoregional reference reach data collected in the ecoregion [68f]; N=# samples