

2009 Monitoring Summary



§303(d)/TMDL Monitoring Site

Mud Creek at U.S. Hwy 31, Cullman County (34.05504/-86.76423)

BACKGROUND

Mud Creek, from State Hwy 31 to its source, was placed on Alabama's 2006 Clean Water Act (CWA) §303(d) list of impaired waters for not meeting its *Fish & Wildlife (F&W)* water use classification. It was listed for impairment caused by organic enrichment and low dissolved oxygen concentrations (OE/DO).

The Alabama Department of Environmental Management (ADEM) monitored Mud Creek at MUDC-2 to document impairment resulting from urban runoff/stormsewers. 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. Reach Characteristics of Mud Creek at MUDC-2, August 6, 2010.

WATERSHED CHARACTERISTICS

The Mud Creek watershed at MUDC-2 is located within the Southern Table Plateaus Ecoregion (68d) in Cullman County. Based on the 2006 National Land Cover Dataset, landuse within the watershed was composed primarily of pasture/hay and cultivated crops (45%) with some forested areas (32%) (Table 1). As of September 1, 2012, there were a total of thirteen NPDES permits 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. Mud Creek at MUDC-2 is a small, open stream reach characterized by sand and clay substrates. Pools, deeper areas with lower velocities, comprised 100 percent of the available habitat (Figure 1). Overall habitat quality was categorized as *poor* due to excessive sedimentation, poor instream habitat quality and a narrow riparian buffer.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Black Warrior River
Drainage Area (mi²)		10
Ecoregion^a		68d
% Landuse		
Open water		<1
Wetland	Woody	1
Forest	Emergent herbaceous	
	Deciduous	17
	Evergreen	8
	Mixed	7
Shrub/scrub		7
Grassland/herbaceous		1
Pasture/hay		38
Cultivated crops		7
Development	Open space	8
	Low intensity	4
	Moderate intensity	2
	High intensity	<1
Barren		<1
Population/km^{2b}		93
# NPDES Permits^c	TOTAL	13
Construction Stormwater		11
Industrial Individual		1
Underground Injection Control		1

a.Southern Table Plateaus

b.2000 US Census

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

Table 2. Physical Characteristics of Mud Creek at MUDC-2, June 2, 2009.

Physical Characteristics	
Width (ft)	25
Canopy Cover	Open
Depth (ft)	
	Pool 3
% of Reach	Pool 100
% Substrate	
	Boulder 1
	Clay 10
	Cobble 2
	Mud/Muck 2
	Gravel 1
	Sand 78
	Silt 5
	Organic Matter 1

Table 3. Results of the habitat assessment conducted on Mud Creek at MUDC-2, June 2, 2009.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	39	Poor <41
Sediment Deposition	24	Poor <41
Sinuosity	20	Poor <45
Bank and Vegetative Stability	59	Marginal (35-59)
Riparian Buffer	28	Poor <50
Habitat Assessment Score	86	
% Maximum Score	39	Poor <41

Table 4. Results of the macroinvertebrate bioassessment conducted at MUDC-2, June 2, 2009.

Macroinvertebrate Assessment		
	Results	Scores
Taxonomic composition measures		(0-100)
# EPT taxa	4	0
Taxonomic composition measures		
% Non-insect taxa	19	21
% Dominant taxon	24	66
% EPC taxa	16	3
Functional feeding group measures		
% Predators	9	34
Tolerance measures		
% Taxa as Tolerant	51	0
WMB-I Assessment Score	---	19
WMB-I Assessment Rating		Very poor (<20)

Table 5. Summary of water quality data collected March-October, 2009. 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
Physical						
Temperature (°C)	9	13.2	28.9	23.2	21.8	5.9
Turbidity (NTU)	9	7.5	19.9	12.4 ^M	13.0	4.7
Total Dissolved Solids (mg/L)	8	47.0	104.0	81.5	76.9	22.0
Total Suspended Solids (mg/L)	8	2.0	11.0	7.0	6.2	3.1
Specific Conductance (µmhos)	9	72.0	165.0	107.0 ^G	112.4	32.1
Alkalinity (mg/L)	8	24.8	74.7	34.2 ^M	46.2	22.0
Stream Flow (cfs)	6	<0.1	>18.2	1.3	5.7	7.5
Chemical						
Dissolved Oxygen (mg/L)	9	5.2	11.3	8.3	8.5	2.0
pH (su)	9	6.4	7.6	7.2	7.2	0.4
Ammonia Nitrogen (mg/L)	3	< 0.006	0.025	0.003	0.010	0.013
Nitrate+Nitrite Nitrogen (mg/L)	8	< 0.003	1.864	0.296	0.708	0.840
Total Kjeldahl Nitrogen (mg/L)	3	0.331	0.711	0.398	0.480	0.203
Total Nitrogen (mg/L)	3	< 0.402	1.194	0.440	0.679	0.447
Dissolved Reactive Phosphorus (mg/L)	7	< 0.008	0.098	0.044	0.052	0.041
Total Phosphorus (mg/L)	3	< 0.039	0.069	0.048	0.052	0.015
CBOD-5 (mg/L)	8	< 1	< 1	0.5	0.5	0.0
Chlorides (mg/L)	8	2.1	12.3	2.8	3.8	3.4
Biological						
Chlorophyll a (ug/L)	8	< 1	2.14	1.30	1.20	0.65

B=one or more samples excluded from calculations because they did not meet laboratory QC requirements; J=estimate; N=# samples; M=value > 90th percentile of all data collected within ecoregion 68d; G=value > median of all verified ecoregional reference reach data collected in the ecoregion 68d.

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 *very poor* condition (Table 4).

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. In situ measurements and water samples were collected monthly during March through October, 2009 to help identify any stressors in the biological communities.

Stream flows were <2.0 cfs, June-September, and could not be measured in October during a high flow event. Median concentrations of turbidity and alkalinity were higher than the 90th percentile of data collected at reference reaches in ecoregion 68d. Median specific conductance was higher than the median concentration of data collected at reference reaches in this ecoregion.

SUMMARY

As part of the assessment process ADEM will review the monitoring information presented in this report, along with all other available data. Results of the 2009 bioassessment indicated the macroinvertebrate community in Mud Creek at MUDC-2 to be in *very poor* condition. Intensive water quality data identified turbidity, specific conductance and alkalinity as parameters of concern at this site. The extremely low stream flows experienced during 2009 may also have impacted the macroinvertebrate community.

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