Alabama Department of Environmental Management

§303(d)/TMDL Monitoring Site

Rivers and Streams Monitoring Program

2005 Monitoring Summary

Very Poor

Three Mile Branch at AL Hwy 152 (Montgomery Co.) (32.42232/-86.25517)

BACKGROUND

Three Mile Branch from Lower Wetumpka Road to its source has been on Alabama's Clean Water Act (CWA) §303(d) list of impaired waters since 2002. It is listed for pesticides from unknown sources.

In 2005, the Alabama Department of Environmental Management (ADEM) monitored Three Mile Branch at TMBM-2 to document impairment from pesticides and to identify possible sources of the contamination. Macroinvertebrate and habitat assessments were conducted to verify impairment to aquatic communities. Results from these data may also be used in determination of Total Maximum Daily Load needs and priorities.

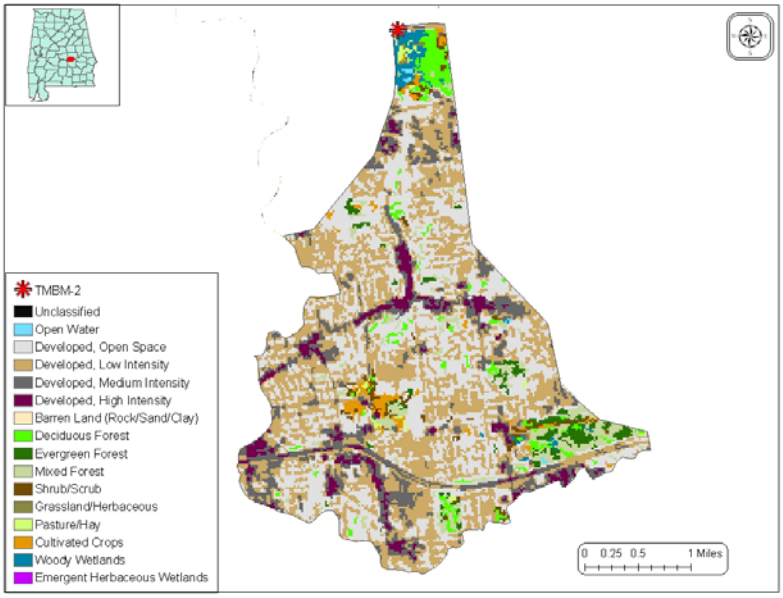

Figure 1. sampling location and watershed of Three Mile Branch at TMBM-2.

WATERSHED CHARACTERISTICS

The Three Mile Branch watershed at TMBM-2 is a small *Fish & Wildlife (F&W)* stream that flows through the city of Montgomery (Fig. 1). Many reaches within the watershed have been converted to culverts. The watershed is in a high population density area where landuse is primarily urban (51%) and forest area (36%). As of June 9, 2008, ADEM's NPDES Management System database showed a total of 37 permitted discharges within the watershed (Table 1).

REACH CHARACTERISTICS

General observations (Table 2) and habitat assessments (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. Three Mile Branch at TMBM-2 is a low-gradient, shaded stream reach characterized by sand, clay, and gravel substrates. Overall habitat quality was categorized as *sub-optimal* due to heavy sediment deposition and a lack of instream habitat.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Drainage Area (mi^2)		9
Ecoregion[a]		65p
% Landuse		
Wetland	Woody	2
Forest	Deciduous	15
	Evergreen	3
	Mixed	16
Shrub/scrub		7
Cultivated crops		6
Development	Open space	11
	Low intensity	26
	Moderate intensity	10
	High intensity	4
Population/km^2[b]		1028
# NPDES Permits[c]	**TOTAL**	37
Construction Stormwater		37

a.Southeastern Flood Plains and Low Terraces

b.2000 U.S. Census Data

c.#NPDES permits downloaded from ADEM's NPDES Management System database, 9 Jun 2008

Table 2. Summary of physical characteristics at TMBM-2, June 14, 2005.

Physical Characteristics		
Width (ft)		15
Canopy cover		Shaded
Depth (ft)		
	Riffle	0.5
	Run	0.7
	Pool	0.5
% of Reach		
	Riffle	10
	Run	85
	Pool	5
% Substrate		
	Gravel	10
	Sand	61
	Silt	5
	Clay	20
	Organic Matter	4

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 an average of the score for each metric. Metric results indicated the macroinvertebrate community to be characterized by pollution-tolerant non-insect taxa goups, indicating *very poor* community condition (Table 4).

Table 3. Results of the habitat assessment conducted at TMBM-2, June 14, 2005.

Habitat Assessment (% Maximum Score)		Rating
Instream habitat quality	48	Marginal (40-52)
Sediment deposition	20	Poor (<40)
Sinuosity	70	Sub-optimal (65-84)
Bank and vegetative stability	54	Marginal (35-59)
Riparian buffer	86	Sub-optimal (70-90)
Habitat assessment score	132	
% Maximum score	**55**	**Sub-optimal (53-65)**

Table 4. Results of the macroinvertebrate bioassessment conducted at TMBM-2, June 14, 2005.

Macroinvertebrate Assessment Results			
	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	2	17	Very Poor (<22)
Taxonomic composition measures			
% Non-insect taxa	32	-26	Very Poor (<24.7)
% Non-insect organisms	8	79	Fair (62.7-93.9)
% Plecoptera	0	0	Very Poor (<6.56)
Tolerance measures			
Beck's community tolerance index	0	0	Very Poor (<20.2)
WMB-I Assessment Score	**---**	**14**	**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 (metals), or quarterly (pesticides, herbicides (atrazine), and semi-volatile organics) during March through October of 2005 to help identify any stressors to the biological communities. Results of water chemistry analyses are presented in Table 5. Median concentrations of total dissolved solids, specific conductance, hardness and alkalinity were above values expected in the southeastern floodplains ecoregion. Median nutrient concentrations, CBOD-5, chlorides, and atrazine were greater than expected in ecoregion 65p. The site did not exceed numeric criteria for metals. However, median concentrations of total and dissolved manganese were higher than values expected in this ecoregion. The fecal coliform count was >2,000 colonies/100 mL in 3 of 7 (43%) samples collected (March 23rd, July 12 and August 18th), above water quality criteria for its *F&W* use classification.

CONCLUSIONS

Results of the 2005 macroinvertebrate assessment indicated the macroinvertebrate community to be in *very poor* condition. Results of intensive water quality sampling and a habitat assessment suggest that sedimentation, nutrient enrichment, pathogens, and elevated metals could be potential causes of the degraded biological condition.

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Table 5. Summary of water quality data collected March-October, 2005. 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	Median	Avg	SD
Physical						
Temperature (ºC)	7	19.0	26.0	25.0	23.1	3.0
Turbidity (NTU)	7	1.9	14.9	3.7	5.4	4.4
Total Dissolved Solids (mg/L)	7	94.0	109.0	100.0M	100.6	6.3
Total Suspended Solids (mg/L)	7	3.0	18.0	6.0	7.4	5.3
Specific Conductance (µmhos)	7	111.8	153	132.0M	132.6	13.7
Hardness (mg/L)	4	45.9	60.4	46.6M	49.9	7.0
Alkalinity (mg/L)	7	40.2	54.9	46.5M	48.0	5.5
Stream Flow (cfs)	6	2.8	5.4	4.2	4.1	---
Chemical						
Dissolved Oxygen (mg/L)	7	5.5	8	7.1	6.9	0.8
pH (su)	7	6.7	7.1	6.9	6.9	0.2
Ammonia Nitrogen (mg/L)	6	< 0.015	0.036	0.017M	0.020	0.014
Nitrate+Nitrite Nitrogen (mg/L)	7	0.610	1.208	0.932M	0.905	0.231
Total Kjeldahl Nitrogen (mg/L)	7	0.207	0.761	0.491M	0.447	0.191
Total Nitrogen (mg/L)	7	1.089	1.921	1.290M	1.352	0.292
Dissolved Reactive Phosphorus (mg/L)	7	0.005	0.059	0.019M	0.025	0.019
Total Phosphorus (mg/L)	7	0.037	0.115	0.065M	0.070	0.026
CBOD-5 (mg/L)	7	< 1.0	5.4	1.6M	1.9	1.6
J Chlorides (mg/L)	7	5.6	8.3	6.9M	6.9	0.9
Atrazine (µg/L)	2	0.05	0.26	0.16M	0.16	0.15
Total Metals						
Aluminum (mg/L)	4	< 0.02	0.08	0.026	0.035	0.035
Iron (mg/L)	4	0.3	0.94	0.67	0.647	0.300
Manganese (mg/L)	4	0.05	0.14	0.072M	0.083	0.037
Dissolved Metals						
Aluminum (mg/L)	4	< 0.015	0.021	0.014	0.014	0.008
Antimony (µg/L)	4	< 2	< 2	1	1	0
Arsenic (µg/L)	4	< 10	< 10	5	5	0
Cadmium (mg/L)	4	< 0.005	< 0.005	0.002	0.002	0.000
Chromium (mg/L)	4	< 0.004	< 0.004	0.002	0.002	0.000
Copper (mg/L)	4	< 0.005	< 0.005	0.002	0.002	0.000
Iron (mg/L)	4	0.03	0.25	0.10	0.12	0.09
Lead (µg/L)	4	< 2	< 2	1	1	0
Manganese (mg/L)	4	< 0.010	0.090	0.071M	0.059	0.041
Mercury (µg/L)	4	< 0.3	< 0.3	0.2	0.2	0.0
Nickel (mg/L)	4	< 0.006	< 0.006	0.003	0.003	0.000
Selenium (µg/L)	4	< 10	< 10	5	5	0
Silver (mg/L)	4	< 0.003	< 0.003	0.002	0.002	0.000
Thallium (µg/L)	4	< 1	< 1	0.5	0.5	0.0
Zinc (mg/L)	4	< 0.006	< 0.006	0.003	0.003	0.000
Biological						
J Fecal Coliform (col/100 mL)	7	110	> 3100	610M	1271	1318

N=# samples; J=Reported value is an estimate; M=value > 25th percentile of all data collected within sub-ecoregion 65p.