

2005 Monitoring Summary



Fourmile Creek at Shelby County Road 61 (33.25649/-86.48980)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Fourmile Creek watershed for biological and water quality monitoring as part of the 2005 Assessment of the Alabama, Coosa, and Tallapoosa (ACT) River Basins. The objectives of the ACT Basin Assessments were to assess the biological integrity of each monitoring site and to estimate overall water quality within the ACT basin group. A habitat and macroinvertebrate assessment was conducted on Fourmile Creek at FRMS-9 on June 28, 2005.

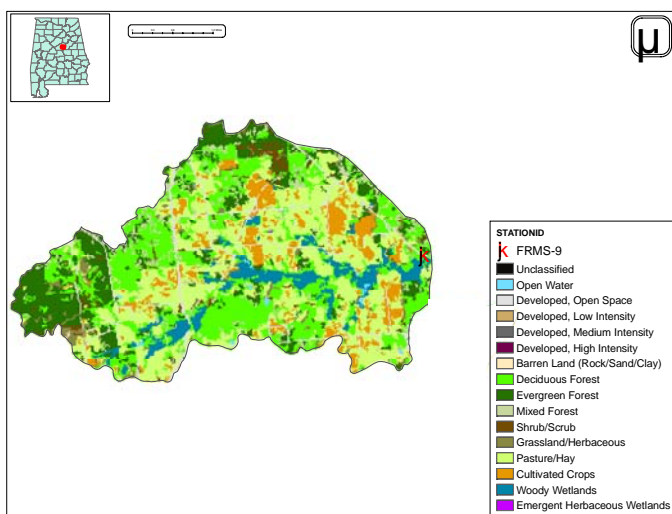


Figure 2. Sampling location and landuse within the Fourmile Creek watershed at FRMS-9.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Fourmile Creek is a small *Fish and Wildlife (F&W)* stream located in Shelby County. At FRMS-9, the stream drains approximately fifteen square miles of countryside. Landuse within the watershed is primarily forest (46%), and pasture with some cropland areas.

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. Fourmile Creek at FRMS-9 is a moderate-gradient, riffle-run stream characterized by bedrock, gravel, and sand substrates. Although, habitat quality and availability was rated as *optimal* for supporting diverse aquatic macroinvertebrate communities, high sand and gravel substrates (62%) indicate a reduction of instream habitat quality from siltation.

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 all individual metric scores. The final score indicated the biological community to be in *fair* condition and characterized by a pollution tolerant macroinvertebrate community (Table 4). Results of macroinvertebrate bioassessments conducted during 2000, 2002, and 2003 indicated the community to be in *poor* condition.

Table 1. Summary of watershed characteristics.

Physical Characteristics		
Drainage Area (mi ²)		15
Ecoregion ^a		67f
% Landuse		
Open water		<1
Wetland	Woody	6
	Emergent herbaceous	<1
Forest	Deciduous	26
	Evergreen	15
	Mixed	5
Shrub/scrub		2
Grassland/herbaceous		3
Pasture/hay		29
Cultivated crops		9
Development	Open space	4
	Low intensity	<1
	Moderate intensity	<1
Barren		<1
Population/km ² ^b		24
# NPDES Permits ^c	TOTAL	7
Construction Stormwater		7

- a. Southern Limestone/Dolomite Valleys and Low Rolling Hills
- b. 2000 U.S. Census data
- c. #NPDES permits from ADEM's NPDES Management System database, 9 Jun 2008

Table 2. Summary of Reach Characteristics

Physical Characterization		
Width (ft)		25
Canopy cover		Mostly Shaded
Depth (ft)		
	Riffle	0.3
	Run	1.0
	Pool	1.5
% of Reach		
	Riffle	10
	Run	80
	Pool	10
% Substrate		
	Bedrock	20
	Boulder	2
	Cobble	4
	Gravel	30
	Sand	32
	Silt	8
	Organic Matter	4

Table 3. Results of habitat assessment conducted June 28, 2005.

Habitat Assessment (% Maximum Score)		Rating
Instream habitat quality	64	Sub-optimal (59-70)
Sediment deposition	70	Sub-optimal (59-70)
Sinuosity	68	Sub-optimal (65-84)
Bank and vegetative stability	68	Sub-optimal (60-74)
Riparian buffer	90	Sub-optimal (70-90)
Habitat assessment score	173	
% Maximum score	72	Optimal (> 70)

Table 4. Results of macroinvertebrate assessment conducted June 28, 2005.

Macroinvertebrate Assessment Results			
	Results	Scores	Rating
Taxa richness measures		(0-100)	
# Ephemeroptera (mayfly) genera	12	100	Excellent (>85)
# Plecoptera (stonefly) genera	1	17	Poor (16-31)
# Trichoptera (caddisfly) genera	15	100	Excellent (>83)
Taxonomic composition measures			
% Non-insect taxa	7	71	Fair (49.4-74.1)
% Non-insect organisms	6	85	Fair (62.7-93.9)
% Plecoptera	1	4	Very Poor (<6.56)
Tolerance measures			
Beck's community tolerance index	20	71	Good (60.7-80.4)
WMB-I Assessment Score	---	64	Fair (48-72)

WATER CHEMISTRY

Results of water chemistry 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. Median total dissolved solids, conductivity, and carbonaceous 5-day biochemical oxygen demand (CBOD-5) values were slightly elevated for this ecoregion. The fecal coliform count was above the 2000 colonies/100 mL criteria for Fish & Wildlife Use Classification during one of six sampling events, with 5,100 colonies/100 mL measured during March 23, 2005. However, stream flows at the time of collection were documented to be above normal and may account for the elevated fecal coliform results.

CONCLUSIONS

Bioassessment results suggest that the condition of the macroinvertebrate community has improved since sampling began in 2000. However, median values of conductivity, total dissolved solids, and carbonaceous 5-day biochemical oxygen demand were elevated. Siltation and habitat degradation were also potential issues at the site. Landuse within the watershed suggest runoff from agricultural and urban areas to be possible sources of these stresses to the biological community.

Table 5. Summary of water quality data collected March-October, 2005. 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. Metals results were compared to ADEM's chronic aquatic life use criteria adjusted for hardness.

Parameter	N	Min	Max	Median	Avg	SD
Physical						
Temperature (°C)	8	14.0	24.0	21.0	20.2	3.6
Turbidity (NTU)	8	1.8	83.5	4.5	15.1	27.9
Total dissolved solids (mg/L)	7	64.0	216.0	142.0	147.3	50.8
Total suspended solids (mg/L)	7	6.0	111.0	20.0 ^M	36.3	38.4
Specific conductance (µmhos)	8	53.5	343.3	259.4 ^M	240.0	91.8
Hardness (mg/L)	4	21.9	201.0	157.5 ^M	134.5	78.6
Alkalinity (mg/L)	7	21.9	170.4	110.9	110.7	51.3
Stream Flow (cfs)	7	0.3	30.1	6.7	9.4	---
Chemical						
Dissolved oxygen (mg/L)	8	6.4	8.3	7.7	7.4	0.7
pH (su)	8	7.1	8.4	7.8	7.8	0.4
Ammonia Nitrogen (mg/L)	7	< 0.015	< 0.015	0.008	0.008	0.000
Nitrate+Nitrite Nitrogen (mg/L)	7	0.003	0.385	0.196	0.178	0.125
Total Kjeldahl Nitrogen (mg/L)	7	0.150	0.794	0.218	0.294	0.252
Total nitrogen (mg/L)	7	0.076	0.860	0.460	0.472	0.238
Dissolved reactive phosphorus (mg/L)	7	< 0.004	0.035	0.011	0.013	0.013
Total phosphorus (mg/L)	7	0.004	0.077	0.040	0.041	0.026
CBOD-5 (mg/L)	7	< 1.0	3.1	2.5 ^M	2.2	1.0
COD (mg/L)	3	< 2.0	< 2.0	1.0	1.0	0
Chlorides (mg/L)	7	3.4	2.0	5.0 ^M	5.3	1.2
Atrazine (µg/L)	2	< 0.05	< 0.05	0.03	0.03	0.00
Total Metals						
Aluminum (mg/L)	4	< 0.015	0.732	0.039	0.204	0.4
Iron (mg/L)	4	0.082	0.855	0.196	0.332	0.4
Manganese (mg/L)	4	0.01	0.057	0.015	0.024	0.02
Dissolved Metals						
Aluminum (mg/L)	4	< 0.015	0.102	0.008	0.031	0.0
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	0.003	0.003	0.0
Chromium (mg/L)	4	< 0.004	< 0.004	0.002	0.002	0.0
Copper (mg/L)	4	< 0.005	< 0.005	0.003	0.003	0.0
Iron (mg/L)	4	< 0.005	0.138	0.034	0.052	0.1
Lead (µg/L)	4	< 2	< 2	1	1	0
Manganese (mg/L)	4	< 0.005	0.021	0.005	0.009	0.01
Mercury (µg/L)	4	< 0.3	< 0.3	0.15	0.15	0.0
Nickel (mg/L)	4	< 0.006	< 0.006	0.003	0.003	0.0
Selenium (µg/L)	4	< 10	< 10	5	5	0
Silver (mg/L)	4	< 0.003	< 0.003	0.002	0.002	0.0
Thallium (µg/L)	4	< 1	< 1	0.5	0.5	0
Zinc (mg/L)	4	< 0.006	< 0.006	0.003	0.003	0.0
Biological						
† Chlorophyll a (µg/L)	7	1.07	7.48	2.14	3.74	2.9
† Fecal Coliform (col/100 mL)	7	20	5100 ^C	80	909	1877

J=estimate; N=# samples; C=value exceeds established criteria for Fish & Wildlife use classification; M=value > 90% of ADEM's verified reference reaches collected in ecoregions 65a/b

FOR MORE INFORMATION, CONTACT:
 Brien Diggs, ADEM Aquatic Assessment Unit
 1350 Coliseum Boulevard Montgomery, AL 36110
 (334) 260-2750 lod@adem.state.al.us