

2015 Monitoring Summary



Fourmile Creek at Bibb County Road 10 (33.07702/-86.97035)

BACKGROUND

Fourmile Creek is one of the streams the Alabama Department of Environmental Management (ADEM) monitors as a “best attainable condition” reference watershed for comparison with streams throughout the Southern Limestone/Dolomite Valleys and Low Rolling Hills (67f) subcoregion. It is among the least-disturbed watersheds in ecoregion 67f, based on land use, road density, and population density. Fourmile Creek was also sampled as part of the 2015 statewide monitoring plan. The objectives of this project were to assess the biological integrity of each monitoring site and to estimate overall water quality within the basin.



Figure 1. Fourmile Creek at FRMB-8, June 12, 2012.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Fourmile Creek at FRMB-8 is a *Fish & Wildlife (F&W)* stream that is a tributary to Little Cahaba River. Based on the 2011 National Land Cover Dataset, landuse within the watershed is primarily forest (86%). As of April 1, 2016, no outfalls were active 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. Fourmile Creek at FRMB-8 is a riffle-run stream with a bottom substrate dominated by gravel (Figure 1). Habitat quality and availability were rated *optimal* for supporting diverse aquatic macroinvertebrate communities.

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 *fair* condition (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin	Cahaba River	
Drainage Area (mi²)	7	
Ecoregion^a	67F	
% Landuse^b		
Forest	Deciduous	20%
	Evergreen	61%
	Mixed	5%
Shrub/scrub	6%	
Grassland/herbaceous	4%	
Development	Open space	4%
	Low intensity	<1%
Barren	<1%	
Population/km^{2c}	1	

a. Southern Limestone/Dolomite Valleys and Low Rolling Hills

b. 2011 National Land Cover Dataset

c. 2010 US Census

Table 2. Physical characteristics of Fourmile Creek at FRMB-8, May 20, 2015.

Physical Characteristics	
Width (ft)	20
Canopy Cover	Estimate 50/50
Depth (ft)	
	Riffle 0.5
	Run 1.0
	Pool 1.5
% of Reach	
	Riffle 20
	Run 70
	Pool 10
% Substrate	
	Bedrock 10
	Boulder 5
	Cobble 8
	Gravel 60
	Sand 10
	Silt 2
	Organic Matter 5

Table 3. Results of the habitat assessment conducted on Fourmile Creek at FRMB-8, May 20, 2015.

Habitat Assessment	% Maximum Score	Rating
Instream Habitat Quality	78	Sub-Optimal (55-79)
Sediment Deposition	83	Optimal (>79)
Riffle frequency	87.5	Optimal (>79)
Bank Vegetative Stability	86	Optimal (>79)
Riparian Buffer	93	Optimal (>84)
Habitat Assessment Score	169	
% Maximum Score	89	Optimal (>80)

Table 4. Results of the macroinvertebrate bioassessment conducted in Fourmile Creek at FRMB-8, May 20, 2015.

Macroinvertebrate Assessment		
	Results	Scores
Taxa richness and diversity measures		(0-100)
# EPT taxa	23	83
Shannon Diversity	4.21	70
Taxonomic composition measures		
% EPT minus Baetidae and Hydropsychidae	11	23
% Non-insect taxa	6	85
Tolerance measures		
% Tolerant taxa	20	85
WMB-I Assessment Score	---	69
WMB-I Assessment Rating		Fair (47-69)

WATER CHEMISTRY

Results of water chemistry are presented in Table 5. In situ measurements and water samples were collected monthly, March through October of 2015 to help identify any stressors to the biological communities. Organics were not collected at FRMB-8. The median concentration for dissolved iron was higher than background levels for ecoregion 67f. On June 10th, E.coli exceeded *F&W* use class criterion.

SUMMARY

ADEM is currently monitoring Fourmile Creek at FRMB-8 as a "best attainable" condition reference watershed. Landuse, road density, and population density categorize Fourmile Creek among the least-disturbed watersheds in the Southern Limestone/Dolomite Valleys and Low Rolling Hills ecoregion. E.coli sampled during the month of June exceeded *F&W* use classification. Bioassessment results indicated the macroinvertebrate community at FRMB-8 to be in *fair* condition.

Table 5. Summary of water quality data collected March-October, 2015. 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	15.4	23.1	19.7	19.7	2.5	
Turbidity (NTU)	#	1.0	16.9	5.3	6.2	4.2	
Total Dissolved Solids (mg/L)	8	53.0	199.0	74.5	88.9	47.7	
Total Suspended Solids (mg/L)	8	< 1.0	3.0	0.8	1.2	1.0	
Specific Conductance (µmhos/cm)	9	58.0	321.0	112.0	128.6	80.1	
Hardness (mg/L)	4	8.3	194.0	84.9	93.0	77.0	
Alkalinity (mg/L)	8	9.5	163.0	37.6	49.7	49.2	
Monthly Stream Flow (cfs)	#	0.1	9.6	1.1	2.5	3.1	
Measured Stream Flow (cfs)	#	0.4	9.6	1.3	2.9	3.2	
Chemical							
Dissolved Oxygen (mg/L)	9	8.5	10.5	9.1	9.3	0.6	
pH (SU)	9	7.4	8.5	8.0	8.0	0.3	
Ammonia Nitrogen (mg/L)	8	< 0.007	0.135	0.004	0.027	0.046	
Nitrate+Nitrite Nitrogen (mg/L)	8	< 0.007	0.070	0.040	0.040	0.022	
Total Kjeldahl Nitrogen (mg/L)	8	< 0.056	0.526	0.123	0.178	0.166	
Total Nitrogen (mg/L)	8	< 0.062	0.580	0.171	0.218	0.172	
Dis Reactive Phosphorus (mg/L)	8	< 0.005	0.038	0.004	0.008	0.012	
Total Phosphorus (mg/L)	8	< 0.007	0.019	0.009	0.010	0.005	
CBOD-5 (mg/L)	8	< 2.0	< 2.0	1.0	1.0	0.0	
COD (mg/L)	8	< 1.6	11.6	4.3	4.9	4.0	
TOC (mg/L)	8	1.2	3.9	1.8	2.0	1.0	
Chlorides (mg/L)	8	1.2	2.6	2.0	2.0	0.5	
Total Metals							
Aluminum (mg/L)	4	< 0.014	0.174	0.088	0.089	0.069	
Iron (mg/L)	4	0.057	0.717	0.291	0.339	0.286	
Manganese (mg/L)	4	0.007	0.019	0.010	0.012	0.005	
Dissolved Metals							
Aluminum (mg/L)	4	< 0.014	0.059	0.016	0.024	0.024	
Antimony (µg/L)	4	< 0.233	< 0.233	0.116	0.116	0.000	
Arsenic (µg/L)	4	< 0.146	0.252	0.239	0.201	0.085	
Cadmium (µg/L)	4	< 0.118	< 0.118	0.059	0.059	0.000	
Chromium (µg/L)	4	< 0.131	0.299	0.218	0.200	0.102	
Copper (µg/L)	4	< 0.180	< 0.180	0.090	0.090	0.000	
Iron (mg/L)	4	0.066	0.251	0.130 ^M	0.144	0.092	
Lead (µg/L)	4	< 0.168	< 0.168	0.084	0.084	0.000	
Manganese (mg/L)	4	0.007	0.009	0.008	0.008	0.001	
Nickel (µg/L)	4	< 0.232	< 0.232	0.116	0.116	0.000	
Selenium (µg/L)	4	< 0.341	< 0.341	0.170	0.170	0.000	
Silver (µg/L)	4	< 0.208	< 0.208	0.104	0.104	0.000	
Thallium (µg/L)	4	< 0.153	< 0.153	0.076	0.076	0.000	
Zinc (µg/L)	4	< 0.857	6.670	0.428	1.989	3.121	
Biological							
Chlorophyll a (mg/m³)	8	< 1.00	< 1.00	0.50	0.50	0.00	
E. coli (MPN/DL)	8	45.2	579.4 ^H	115.2	204.7	203.7	1

C=*F&W* use class criteria exceeded; E=# samples with exceedances; J=estimate; M=value >90% of all verified ecoregional reference reach data collected in the ecoregion 67f; N=# samples.

FOR MORE INFORMATION, CONTACT:
 Alicia K. Phillips, ADEM Environmental Indicators Section
 1350 Coliseum Boulevard Montgomery, AL 36110
 (334) 260-2797 akphillips@adem.alabama.gov