Alabama Department of Environmental Management

Ecological Reference Reach

Rivers and Streams Monitoring Program

2012 Monitoring Summary

Good

Gabriel Creek at Hale Co Rd 21 (32.94227/-87.65974)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Gabriel Creek watershed for biological and water quality monitoring as part of the 2012 Assessment of the Black Warrior and Cahaba (BWC) River Basins. The objectives of the BWC Basin Assessments were to assess the biological integrity of each monitoring site and to estimate overall water quality within the ACT basin group.

Additionally, Gabriel Creek is among least-disturbed watershed in the BWC basin group based on landuse, road density, and population density. The 2012 data will also be used to evaluate the use of Gabriel Creek as a "*best attainable*" condition reference watershed for comparison with other Fall Line Hills streams.

Figure 1. Gabriel Creek at GABH-39A, April 24, 2012

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Black Warrior River
Drainage Area (mi^2)		17
Ecoregion[a]		65i
% Landuse		
Open water		<1
Wetland	Woody	4
Forest	Deciduous	44
	Evergreen	16
	Mixed	17
Shrub/scrub		10
Grassland/herbaceous		1
Pasture/hay		4
Cultivated crops		1
Development	Open space	2
	Low intensity	<1
	Moderate intensity	<1
Population/km^2[b]		7

a.Fall Line Hills
b.2000 US Census

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Gabriel Creek at GABH-39A is a *Fish & Wildlife (F&W)* stream located within the Fall Line Hills ecoregion of Hale County (Figure 1). Based on the 2006 National Landcover Dataset, landuse in the watershed is primarily forest (77%). Population density is relatively low in the watershed. ADEM has issued no NPDES permits within this watershed.

Table 2. Physical characteristics of Gabriel Creek at GABH-39a, April 24, 2012.

Physical Characteristics	
Canopy Cover	Shaded
Width (ft)	20
Depth (ft)	
Run	1.5
Pool	3.5
% of Reach	
Run	85
Pool	15
% Substrate	
Clay	5
Gravel	20
Sand	50
Silt	10
Organic Matter	15

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. Gabriel Creek at GABH-39A is a low-gradient, sand and gravel bottomed stream. Habitat quality and availability was rated as *sub-optimal* for supporting diverse aquatic macroinvertebrate communities. Eroding banks and limited riparian buffers and habitat were noted within the reach.

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. The final score indicated the biological community to be in *good* condition (Table 4).

Table 3. Results of the habitat assessment conducted on Gabriel Creek at GABH-39A, April 24, 2012.

Habitat Assessment	%Maximum Score	Rating
GP		
Instream Habitat Quality	59	Sub-optimal (53-65)
Sediment Deposition	65	Sub-optimal (53-65)
Sinuosity	58	Marginal (45-64)
Bank and Vegetative Stability	53	Marginal (35-59)
Riparian Buffer	34	Poor <50
Habitat Assessment Score	**122**	
% Maximum Score	**55**	Sub-optimal (53-65)

Table 4. Results of the macroinvertebrate bioassessment conducted in Gabriel Creek at GABH-39A , April 24, 2012.

Macroinvertebrate Assessment		
	Results	**Scores**
Taxa richness and diversity measures		**(0-100)**
% EPC taxa	30	54
% Dominant Taxon	27	58
Taxonomic composition measures		
% EPT minus Baetidae and Hydropsychidae	8	14
Functional feeding group		
# Collector Taxa	30	100
Community tolerance		
% Nutrient Tolerant individuals	24	70
WMB-I Assessment Score	**---**	**59**
WMB-I Assessment Rating		**Good (48-74)**

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 2012 to help identify any stressors to the biological communities.

In situ measurements indicated that Gabriel Creek at GABH-39A generally met the water quality criteria for its *F&W* water use classification. Stream pH was 5.8 s.u. during a high flow (44.2 cfs) event in September.

SUMMARY

To be used for comparison with other streams, "best-attainable" reference reaches must be representative of other streams in the ecoregion. Gabriel Creek at GABH-39A was typical of other streams in the Fall Line Hills. The macroinvertebrate community was in good condition, and water quality results were within normal ranges for this stream type. However, eroding banks and limited habitat and riparian buffers were noted within the reach.

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

Table 5. Summary of water quality data collected March-October, 2012. 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	E
Physical							
Temperature (°C)	8	12.0	24.1	21.1	19.9	4.2	
Turbidity (NTU)	9	7.1	56.9	13.4	22.9	18.6	
Total Dissolved Solids (mg/L)	8	18.0	72.0	43.0	43.8	17.5	
Total Suspended Solids (mg/L)	8	<1	34.0	7.5	12.1	13.4	
Specific Conductance (µmhos)	8	23.2	25.8	24.5	24.6	0.9	
Hardness (mg/L)	4	5.9	6.4	6.0	6.1	0.2	
[J]Alkalinity (mg/L)	8	2.3	6.5	6.0	5.5	1.3	
Stream Flow (cfs)	9	7.1	44.2	10.5	15.1	12.2	
Chemical							
Dissolved Oxygen (mg/L)	8	6.6	9.5	7.6	7.9	0.9	
pH (su)	8	5.8[C]	6.6	6.3	6.3	0.3	1
Ammonia Nitrogen (mg/L)	8	<0.008	0.051	0.004	0.019	0.021	
[J]Nitrate+Nitrite Nitrogen (mg/L)	8	<0.005	0.069	0.056	0.047	0.026	
Total Kjeldahl Nitrogen (mg/L)	8	<0.041	0.617	0.204	0.232	0.219	
[J]Total Nitrogen (mg/L)	8	<0.023	0.673	0.262	0.279	0.233	
[J]Dissolved Reactive Phosphorus (mg/L)	8	<0.004	0.007	0.005	0.005	0.002	
Total Phosphorus (mg/L)	8	0.020	0.076	0.026	0.034	0.019	
CBOD-5 (mg/L)	8	<2.0	2.0	1.0	1.0	0.0	
Chlorides (mg/L)	8	1.7	2.7	2.4	2.3	0.3	
Total Metals							
[J]Aluminum (mg/L)	4	0.129	0.468	0.279	0.289	0.144	
Iron (mg/L)	4	2.010	3.410	2.370	2.540	0.608	
Manganese (mg/L)	4	0.087	0.180	0.152	0.142	0.040	
Dissolved Metals							
Aluminum (mg/L)	4	<0.043	<0.043	0.022	0.022	0.000	
Antimony (µg/L)	4	<3.6	<3.6	1.8	1.8	0.0	
Arsenic (µg/L)	4	<1.8	<1.8	0.9	0.9	0.0	
Cadmium (µg/L)	4	<0.022	0.046	0.017	0.017	0.007	
Chromium (mg/L)	4	<0.009	<0.009	0.004	0.004	0.000	
Copper (mg/L)	4	<0.020	<0.020	0.010	0.010	0.000	
Iron (mg/L)	4	0.337	0.442	0.404	0.397	0.044	
Lead (µg/L)	4	<0.9	<0.9	0.4	0.4	0.0	
Manganese (mg/L)	4	0.070	0.148	0.118	0.114	0.032	
Mercury (µg/L)	4	<0.035	<0.035	0.018	0.018	0.000	
Nickel (mg/L)	4	<0.042	<0.042	0.021	0.021	0.000	
Selenium (µg/L)	4	<2.5	<2.5	1.2	1.2	0.0	
Silver (µg/L)	4	<0.015	0.215	0.058	0.058	0.058	
Thallium (µg/L)	4	<1.4	<1.4	0.7	0.7	0.0	
Zinc (mg/L)	4	<0.012	<0.012	0.006	0.006	0.000	
Biological							
Chlorophyll a (ug/L)	8	<0.10	2.67	0.81	1.22	1.30	
E. coli (col/100mL)	8	161	2420	318	648	769	

C=*F&W* criterion violated; E=# samples that exceeded criteria; J=estimate; N=# samples.