

2008 Monitoring Summary



Big Creek at Burnt Our Bridge Road off AL Hwy 87 (31.73780/-85.98310)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Big Creek watershed for biological and water quality monitoring as part of the 2004 Basin-wide Screening Assessment of the South East Alabama (SE-AL) River Basins. The screening assessments were conducted at stream reaches where land use estimates and non-point source information from the local Soil and Water Conservation Districts indicated a moderate or high potential for impairment from non-point sources in non-urban areas. Results of the 2004 screening-level evaluation identified Big Creek at BIGP-1A for further monitoring during the 2008 Basin Assessment of the SE-AL River Basins to more fully assess biological conditions at the site, as well as the extent and cause of any impairment.



Figure 1. Reach characteristics of Big Creek sampling site at BIGP-1A.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Big Creek is a *Fish & Wildlife (F&W)* stream in the Southern Hilly Gulf Coastal Plains ecoregion. Based on the 2000 National Land Cover Dataset, land use within the watershed is primarily forest (53%). Population density is low. As of February 23, 2011, ADEM has issued a total of 47 NPDES permits 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. Big Creek at BIGP-1A is a narrow, low-gradient stream characterized by a sand and clay substrates. Overall habitat quality was categorized as *marginal* due to a poor instream habitat and weak bank and vegetative stability.

BIOASSESSMENT RESULTS

Benthic macroinvertebrate communities were sampled using ADEM's Intensive Multi-habitat Bioassessment methodology (WMB-I). The WMB-I measures 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 each individual metric score. Metric results indicated that the macroinvertebrate community to be in *fair* condition (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin	Choctawhatchee River	
Drainage Area (mi²)	8	
Ecoregion^a	65d	
% Landuse		
Open water		<1
Wetland	Woody	2
	Emergent herbaceous	<1
Forest	Deciduous	19
	Evergreen	18
	Mixed	16
Shrub/scrub		14
Pasture/hay		8
Cultivated crops		5
Development	Open space	8
	Low intensity	4
	Moderate intensity	3
	High intensity	2
Population/km^{2b}	7	
# NPDES Permits^c	TOTAL	47
	Construction Stormwater	43
	Industrial General	3
	Municipal Individual	1

a.Southern Hilly Gulf Coastal Plain

b.2000 US Census

c.#NPDES permits downloaded from ADEM's NPDES Management System database, February 23, 2011

Table 2. Physical characteristics of Big Creek at BIGP-1A, May 29, 2008.

Physical Characteristics		
Width (ft)	10	
Canopy Cover	Estimate 50/50	
Depth (ft)	Run	1.1
	Pool	1.5
% of Reach	Run	70
	Pool	30
% Substrate	Clay	40
	Mud/Muck	1
	Sand	50
	Silt	5
	Organic Matter	4

Table 3. Results of the habitat assessment conducted on Big Creek at BIGP-1A, May 29, 2008.

Habitat Assessment	%Max Score	Rating
Instream Habitat Quality	28	Poor <40
Sediment Deposition	58	Sub-optimal (53-65)
Sinuosity	40	Poor <45
Bank and Vegetative Stability	30	Poor <35
Riparian Buffer	59	Marginal (50-69)
Habitat Assessment Score	100	
% Maximum Score	45	Marginal (40-52)

Table 4. Results of the macroinvertebrate bioassessment conducted in Big Creek at BIGP-1A, May 29, 2008.

Macroinvertebrate Assessment			
	Results	Scores	Rating
Taxa richness measures			
# EPT genera	3	12	Very Poor (<19)
Taxonomic composition measures			
% Non-insect taxa	19	28	Very Poor (<30.9)
% Plecoptera	0	0	Very Poor (<1.86)
% Dominant taxa	22	69	Fair (47.1-70.5)
Functional composition measures			
% Predators	15	51	Good (45.3-72.1)
Tolerance measures			
Beck's community tolerance index	2	9	Very Poor (<10.6)
% Nutrient tolerant organisms	8	100	Excellent (>88.1)
WMB-I Assessment Score	--	39	Fair (38-56)

WATER CHEMISTRY

Results of water chemistry analyses are summarized in Table 5. When possible, in situ measurements and water samples are collected monthly, semi-monthly (metals), or quarterly (pesticides, atrazine, and semi-volatile organics) during the months of April through November 2008 to help identify any stressors to the biological communities. BIGP-1A was sampled in May, July, and September. Median values of specific conductivity, hardness, alkalinity, metals (total manganese, and dissolved iron and dissolved manganese) were higher than expected based on the 90th percentile of reference reach data collected in the Southern Hilly Gulf Coastal Plain ecoregion.

SUMMARY

As part of the assessment process, ADEM will review the monitoring information presented in this report, along with all other available data. Bioassessment results indicated the macroinvertebrate community in Big Creek at BIGP-1A to be in *fair* condition. Metals, specific conductance, alkalinity, and hardness were higher than background levels based on ecoregional data. In stream habitat was also limited.

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Table 5. Summary of water quality data collected March-October, 2008. 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)	4	19.4	24.4	22.5	22.2	2.1	
Turbidity (NTU)	4	12.7	20.6	13.8	15.2	3.6	
Total Dissolved Solids (mg/L)	3	90.0	114.0	90.0	98.0	13.9	
Total Suspended Solids (mg/L)	3	< 1.0	9.0	0.5	3.3	4.9	
Specific Conductance (µmhos)	4	156.2	200.2	163.4 ^G	170.8	20.7	
Hardness (mg/L)	3	58.4	68.5	63.7	63.5	5.0	
Alkalinity (mg/L)	3	56.4	83.3	64.1 ^M	67.9	13.8	
Stream Flow (cfs)	4	0.1	1.7	1.0	0.9	0.8	
Chemical							
Dissolved Oxygen (mg/L)	4	6.4	7.6	7.2	7.1	0.6	
pH (su)	4	7.0	7.1	7.1 ^M	7.1	0.0	
Ammonia Nitrogen (mg/L)	3	< 0.015	0.028	0.008	0.014	0.012	
Nitrate+Nitrite Nitrogen (mg/L)	3	0.090	0.123	0.099	0.104	0.017	J
Total Kjeldahl Nitrogen (mg/L)	3	0.211	0.302	0.273	0.262	0.046	
Total Nitrogen	3	0.334	0.392	0.372	0.366	0.030	J
Dissolved Reactive Phosphorus (mg/L)	3	0.007	0.011	0.008	0.009	0.002	
Total Phosphorus (mg/L)	3	0.018	0.026	0.025	0.023	0.004	
CBOD-5 (mg/L)	3	< 1.0	1.0	0.5	0.5	0.0	
Chlorides (mg/L)	3	4.3	5.5	4.8	4.9	0.6	
Atrazine (µg/L)	2	< 0.05	0.05	0.02	0.02	0.00	
Total Metals							
Aluminum (mg/L)	3	< 0.016	0.025	0.016	0.017	0.008	
Iron (mg/L)	3	1.600	3.050	2.310	2.320	0.725	
Manganese (mg/L)	3	0.387	0.430	0.394 ^M	0.404	0.023	
Dissolved Metals							
Aluminum (mg/L)	3	< 0.015	0.019	0.008	0.008	0.001	
Antimony (µg/L)	3	< 2.0	< 2.0	1.0	1.0	0.0	
Arsenic (µg/L)	3	< 2.2	< 2.2	1.1	1.1	0	
Cadmium (mg/L)	3	< 0.005	<0.005	0.002	0.002	0.000	
Chromium (mg/L)	3	< 0.004	<0.004	0.002	0.002	0.000	
Copper (mg/L)	3	< 0.005	<0.005	0.002	0.002	0.000	
Iron (mg/L)	3	0.737	1.570	0.901 ^M	1.069	0.441	
Lead (µg/L)	3	< 1.5	< 1.5	0.7	0.7	0	
Manganese (mg/L)	3	0.360	0.426	0.372 ^M	0.386	0.035	
Mercury (µg/L)	3	< 0.00	<0.00	0.00	0.00	0	
Nickel (mg/L)	3	< 0.006	<0.006	0.003	0.003	0.000	
Selenium (µg/L)	3	< 1.5	1.6	0.8	0.8	0.0	
Silver (mg/L)	3	< 0.003	<0.003	0.002	0.002	0.000	
Thallium (µg/L)	3	< 0.6	< 0.6	0.3	0.3	0.0	
Zinc (mg/L)	3	< 0.006	<0.006	0.003	0.003	0.000	
Biological							
Chlorophyll a (ug/L)	3	0.53	2.14	1.60	1.42	0.82	
Fecal Coliform (col/100 mL)	3	20	67	50	46	24	J

G=value higher than median concentration of all verified ecoregional reference reach data collected in the ecoregion 65d; J=estimate; M=value >90% of all verified ecoregional reference reach data collected in the ecoregion 65d; N=# samples