

2008 Monitoring Summary



Beaver Creek at Houston County Road 59 (31.21647/-85.48691)

BACKGROUND

A 2.5 mile segment of Beaver Creek from Newton Creek to the Dothan Waste Water Treatment Plant has been on Alabama's Clean Water Act (CWA) 303(d) list of impaired waters since 1998. The impairment is caused by nutrients and organic enrichment from municipal discharges and urban runoff and storm sewers. The Alabama Department of Environmental Management monitored Beaver Creek at BVC-2, located within the impaired reach, to provide data for TMDL development.



Figure 1. Beaver Creek at BVC-2, March 3, 2011.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Beaver Creek at BVC-2 drains approximately 19 square miles. It is a *Fish & Wildlife (F&W)* stream reach located in Dothan, Alabama. Based on the 2000 National Land Cover Dataset, landuse within the watershed mostly consists of development (48%) and forest (20%). Population density is high. As of February 23, 2011, ADEM has issued a total of 110 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. Beaver Creek is characterized by a sandy substrate typical of the Dougherty Plain ecoregion (Figure 1). Overall habitat quality was rated as *marginal* for supporting macroinvertebrate communities due to poor in-stream habitat, weak bank and vegetative stability, channelization, and minimal riparian buffer.

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

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin	Choctawhatchee River	
Drainage Area (mi²)	19	
Ecoregion^a	65g	
% Landuse		
Open water		<1
Wetland	Woody	3
	Emergent herbaceous	<1
Forest	Deciduous	3
	Evergreen	16
	Mixed	1
Shrub/scrub		9
Grassland/herbaceous		1
Pasture/hay		7
Cultivated crops		12
Development	Open space	20
	Low intensity	17
	Moderate intensity	7
	High intensity	4
Population/km^{2b}	400	
# NPDES Permits^c	TOTAL	110
	401 Water Quality Certification	1
	Construction Stormwater	103
	Industrial General	1
	Industrial Individual	2
	Municipal Individual	2
	Underground Injection Control	1

a. Dougherty Plain

b. 2000 US Census

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

Table 2. Physical characteristics of Beaver Creek at BVC-2, May 28, 2008.

Physical Characteristics		
Width (ft)	25	
Canopy Cover	Shaded	
Depth (ft)		
	Run	1.5
	Pool	2.0
% of Reach		
	Run	80
	Pool	20
% Substrate		
	Clay	1
	Mud/Muck	5
	Sand	70
	Silt	15
	Organic Matter	9

Table 3. Results of the habitat assessment conducted in Beaver Creek at BVC-2, May 28, 2008.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	33	Poor <40
Sediment Deposition	60	Sub-optimal (53-65)
Sinuosity	43	Poor <45
Bank and Vegetative Stability	45	Poor <35
Riparian Buffer	78	Marginal (50-69)
Habitat Assessment Score	116	
% Maximum Score	53	Marginal (40-52)

Table 4. Results of the macroinvertebrate assessment conducted in Beaver Creek at BVC-2, May 28, 2008.

Macroinvertebrate Assessment			
	Results	Scores	Rating
Taxa richness measures		(0-100)	
# EPT genera	3	12	Very Poor (<19)
Taxonomic composition measures			
% Non-insect taxa	19	30	Very Poor (<30.9)
% Plecoptera	0	0	Very Poor (<1.86)
% Dominant taxa	31	47	Fair (47.1-70.5)
Functional composition measures			
% Predators	3	10	Very Poor (<15.1)
Tolerance measures			
Beck's community tolerance index	1	5	Very Poor (<10.6)
% Nutrient tolerant organisms	69	2	Very Poor (<25.4)
WMB-I Assessment Score	--	15	Very Poor (<19)

WATER CHEMISTRY RESULTS

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, atrazine, and semi-volatile organics) April through November 2008 to help identify any stressors to the biological communities. Stream pH exceeded criteria applicable to Beaver Creek's *F&W* use classification during one sampling event. Results indicated elevated specific conductance, nitrogen, phosphorus, alkalinity, and chloride, concentrations based on reference reach data collected in ecoregion 65g. Dissolved oxygen was >5.0 mg/L during all sampling events.

SUMMARY

The 2008 monitoring data showed Beaver Creek at BVC-2 to be impaired by nutrient enrichment and organic enrichment, supporting previous assessments. These data also suggest the municipal discharge and urban runoff/storm sewers as the source of these impairments.

Table 5. Summary of water quality data collected April through November, 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	E
Physical								
Temperature (°C)	14	12.9	25.7	24.0	21.8	4.5		
Turbidity (NTU)	13	5.9	20.9	8.7	9.0	3.9		
Total Dissolved Solids (mg/L)	8	72.0	288.0	91.0	115.8	71.5		
Total Suspended Solids (mg/L)	8	< 1.0	11.0	4.0	4.2	3.7		
Specific Conductance (µmhos)	14	129.1	254.2	194.6 ^G	195.3	34.2		
Hardness (mg/L)	3	26.7	38.9	34.5 ^G	33.4	6.2		
Alkalinity (mg/L)	5	34.8	42.8	42.4 ^M	40.6	3.4		
Stream Flow (cfs)	10	0.7	24.3	16.3	15.8	6.2		
Chemical								
Dissolved Oxygen (mg/L)	14	5.3	8.0	6.1	6.3	0.9		
pH (su)	14	6.0	8.9 ^C	6.8	6.8	0.6		1
Ammonia Nitrogen (mg/L)	8	< 0.014	0.051	0.028 ^M	0.027	0.014		
Nitrate+Nitrite Nitrogen (mg/L)	8	0.372	3.600	2.235 ^M	2.145	0.948		
Total Kjeldahl Nitrogen (mg/L)	8	0.246	1.092	0.424	0.533	0.268		
Total Nitrogen (mg/L)	8	0.618	4.008	2.838 ^M	2.678	1.077		
Dissolved Reactive Phosphorus (mg/L)	8	0.087	0.565	0.304 ^M	0.315	0.157		
Total Phosphorus (mg/L)	8	0.156	0.688	0.385 ^M	0.412	0.168		
CBOD-5 (mg/L)	8	< 1.0	2.0	0.5	0.7	0.3		
Chlorides (mg/L)	5	14.3	21.1	14.8 ^M	16.1	2.9		
Atrazine (µg/L)	2	< 0.05	0.05	0.02	0.02	0.00		
Total Metals								
Aluminum (mg/L)	3	0.090	0.215	0.096	0.134	0.070	J	
Iron (mg/L)	3	1.510	1.830	1.540	1.627	0.177		
Manganese (mg/L)	3	0.129	0.189	0.131	0.150	0.034	J	
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	0.0		
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	0.235	0.651	0.490	0.459	0.210		
Lead (µg/L)	3	< 1.5	< 1.5	0.7	0.7	0.0		
Manganese (mg/L)	3	0.061	0.165	0.111	0.112	0.052		
Mercury (µg/L)	3	< 0.0	< 0.0	0.0	0.0	0.0		
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)	6	< 0.10	1.60	1.07	1.08	0.57		
Fecal Coliform (col/100 mL)	3	77	590	530 ^M	399	281	J	

E=# samples that exceeded criteria; G=value higher than median concentration of all verified ecoregional reference reach data collected in the ecoregion 65g; J=estimate; M=value >90% of all verified ecoregional reference reach data collected in the ecoregion 65g; N=# samples; Q=Laboratory qualifier codes

FOR MONITORING INFORMATION, CONTACT:
James Worley ADEM Aquatic Assessment Unit
1350 Coliseum Boulevard Montgomery, AL 36110
(334) 394-4343 jworley@adem.state.al.us