

2009 Monitoring Summary



Beaverdam Creek at Highway 431 Bridge (Madison County)(34.83770/-86.57120)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Beaverdam Creek watershed for biological and water quality monitoring as part of the 2009 Assessment of the Tennessee River Basin. The objectives of the Tennessee Basin Assessments were to assess the biological integrity of each monitoring site and to estimate overall water quality within the basin.



Figure 1. Beaverdam Creek at BVDM-17, September 9, 2009.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Beaverdam Creek is a *Fish & Wildlife (F&W)* stream located in Madison County, approximately four miles north of Huntsville. Based on the 2006 National Land Cover Dataset, landuse within the watershed is primarily cultivated crops and pasture. As of February 23, 2011, 38 NPDES outfalls were active in this 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. Beaverdam Creek at BVDM-17 (Figure 1) is a gravel-bottomed, low-gradient stream reach located in the Eastern Highland Rim ecoregion (Table 1). Overall habitat quality was categorized as *sub-optimal* due to limited instream habitat and riparian buffers, channelization, and eroding banks. Sand, which is considered an unstable habitat, comprised one-third of the stream substrate.

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 *poor* condition (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin	Tennessee River	
Drainage Area (mi ²)	37	
Ecoregion ^a	71g	
% Landuse		
Open water	<1	
Wetland	Woody	6
	Emergent herbaceous	<1
Forest	Deciduous	10
	Evergreen	2
	Mixed	1
Shrub/scrub	7	
Grassland/herbaceous	2	
Pasture/hay	24	
Cultivated crops	41	
Development	Open space	5
	Low intensity	1
	Moderate intensity	<1
	High intensity	<1
Barren	<1	
Population/km ^{2b}	98	
# NPDES Permits ^c	TOTAL	38
	401 Water Quality Certification	1
	Construction Stormwater	27
	Municipal Individual	6
	Underground Injection Control	4

a. Eastern Highland Rim

b. 2000 US Census

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

Table 2. Physical characteristics of Beaverdam Creek at BVDM-17, June 4, 2009.

Physical Characteristics		
Width (ft)	35	
Canopy Cover	Mostly Shaded	
Depth (ft)	Riffle	0.3
	Run	1.5
	Pool	3.5
% of Reach	Riffle	5
	Run	70
	Pool	25
% Substrate	Clay	5
	Cobble	2
	Gravel	50
	Sand	35
	Silt	3
	Organic Matter	5

Table 3. Results of the habitat assessment conducted on Beaverdam Creek at BVDM-17, June 4, 2009.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	58	Marginal (41-58)
Sediment Deposition	66	Sub-optimal (59-70)
Sinuosity	55	Marginal (45-64)
Bank and Vegetative Stability	55	Marginal (35-59)
Riparian Buffer	53	Marginal (50-69)
Habitat Assessment Score	144	
% Maximum Score	60	Sub-optimal (59-70)

Table 4. Results of the macroinvertebrate bioassessment conducted at BVDM-17 on June 4, 2009.

Macroinvertebrate Assessment		
	Results	Scores
Taxa richness and diversity measures		(0-100)
# EPT taxa	7	13
Shannon Diversity	4.28	73
Taxonomic composition measures		
% EPT minus Baetidae and Hydropsychidae	1	1
% Non-insect taxa	20	12
Functional feeding group		
% Predator Individuals	7	25
Community tolerance		
% Tolerant taxa	37	35
WMB-I Assessment Score	---	26
WMB-I Assessment Rating		Poor (15-28)

WATER CHEMISTRY

Results of water chemistry analyses are presented 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 March through October to help identify any stressors to the biological communities. Median pH was lower than expected for the Interior Plateau ecoregion (71). Median conductivity, hardness, chlorides, nutrients (nitrate+nitrite nitrogen, total nitrogen and dissolved reactive phosphorus), total manganese, dissolved aluminum, and dissolved iron concentrations were higher than expected for this ecoregion. Dissolved nickel was also higher than expected for the May 12, 2009 sample date.

SUMMARY

Bioassessment results indicated the macroinvertebrate community to be in *poor* condition. Concentrations of conductivity, hardness, chlorides, nutrients, total manganese, dissolved aluminum, and dissolved iron were elevated as compared to data from ADEM's least-impaired reference reaches in ecoregion 71. Additionally, median pH was lower than expected for this ecoregion. Dissolved nickel was also higher than expected for one sample date. The data presented in this report and all other available data will be reviewed to identify the causes and sources of the degraded biological conditions.

Table 5. Summary of water quality data collected March-October, 2005. Minimum (Min) and maximum (Max) values calculated using minimum detection limits (MDL) when results were less than this value for non-metals parameters. Median (Med), 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	12.6	18.5	16.4	16.1	1.8	
Turbidity (NTU)	9	0.6	9.3	3.2	4.0	3.2	
^J Total Dissolved Solids (mg/L)	8	28.0	180.0	116.0	120.8	49.1	
^J Total Suspended Solids (mg/L)	8 <	1.0	5.0	1.0	1.9	1.8	
Specific Conductance (µmhos)	9	134.9	276.3	226.6 ^G	213.9	51.9	
Hardness (mg/L)	4 <	0.0	134.0	106.8 ^G	86.9	61.6	
Alkalinity (mg/L)	8	63.6	125.0	88.2	93.3	26.8	
Stream Flow (cfs)	8	3.6	73.7	16.6	24.1	24.1	
Chemical							
Dissolved Oxygen (mg/L)	9	7.4	9.0	8.3	8.2	0.6	
pH (su)	9	6.1	7.2	6.9 ^M	6.8	0.3	
^J Ammonia Nitrogen (mg/L)	6 <	0.006	0.040	0.005	0.010	0.014	
^J Nitrate+Nitrite Nitrogen (mg/L)	7	1.710	7.080	2.357 ^M	2.961	1.842	
^J Total Kjeldahl Nitrogen (mg/L)	6 <	0.089	0.738	0.070	0.212	0.272	
^J Total Nitrogen (mg/L)	6	2.202	2.796	2.438 ^M	2.486	0.232	
^J Dissolved Reactive Phosphorus (mg/L)	7	0.016	0.044	0.020 ^M	0.024	0.010	
^J Total Phosphorus (mg/L)	5	0.017	0.043	0.020	0.026	0.011	
CBOD-5 (mg/L)	8 <	1.0	2.4	1.0	1.0	0.6	
Chlorides (mg/L)	8	3.0	4.5	3.8 ^M	3.8	0.6	
Atrazine (µg/L)	2	0.12	0.28	0.20	0.20	0.11	
Total Metals							
^J Aluminum (mg/L)	4	0.039	0.328	0.101	0.142	0.128	
^J Iron (mg/L)	4 <	0.026	0.965	0.250	0.370	0.442	
^J Manganese (mg/L)	4	0.004	0.112	0.030 ^M	0.044	0.048	
Dissolved Metals							
^J Aluminum (mg/L)	4 <	0.019 <	0.051	0.024 ^M	0.027	0.018	
Antimony (µg/L)	4 <	0.7 <	6.0	0.4	1.0	1.3	
Arsenic (µg/L)	4 <	0.4 <	0.4	0.2	0.2	0.0	
Cadmium (µg/L)	4 <	2.000 <	3.000	1.500	1.375	0.250	
Chromium (µg/L)	4 <	7.000 <	13.000	6.500	5.750	1.500	
Copper (mg/L)	4 <	0.013 <	0.200	0.006	0.030	0.047	
^J Iron (mg/L)	4 <	0.021	0.353	0.150 ^M	0.166	0.175	
Lead (µg/L)	4 <	0.5 <	1.0	0.5	0.4	0.1	
^J Manganese (mg/L)	4 <	0.001	0.081	0.023	0.032	0.035	
^J Mercury (µg/L)	3 <	0.080 <	0.080	0.040	0.040	0.000	
^J Nickel (mg/L)	4 <	0.004	0.019 ^S	0.005	0.005	0.003	1
Selenium (µg/L)	4 <	0.4	0.4	0.2	0.2	0.0	
Silver (µg/L)	4 <	1.000 <	2.000	1.000	0.875	0.250	
Thallium (µg/L)	4 <	0.4	0.4	0.2	0.2	0.0	
^J Zinc (mg/L)	4 <	0.003	0.060	0.007	0.012	0.013	
Biological							
Chlorophyll a (ug/L)	7 <	0.10	1.60	0.53	0.69	0.60	
^J Fecal Coliform (col/100 mL)	8	32	80	42	48	17	

G=value higher than median concentration of all verified ecoregional reference reach data collected in the ecoregion 71; Q=# of uncertain exceedances; S=F&W hardness-adjusted aquatic life use criteria exceeded; J=estimate; M=value >90% of all verified ecoregional reference reach data collected in the ecoregion 71; N=# samples.

FOR MORE INFORMATION, CONTACT:

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