Alabama Department of Environmental Management

Basin Assessment Site

Rivers and Streams Monitoring Program

2009 Monitoring Summary

Fair

Baptizing Creek at AL Hwy 99 (Limestone County) (34.91109/-87.10141)

BACKGROUND

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

Figure 1. Baptizing Creek at BPTL-1, July 15, 2009.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Baptizing Creek is a *Fish and Wildlife (F&W)* stream located in Limestone County in the Outer Nashville Basin ecoregion (71h). Based on the 2000 National Land Cover Dataset, landuse within the watershed is primarily forest (55%) and pasture/hay with some shrub, cultivated crops, and development. As of February 23, 2009, ADEM's NPDES Management System database shows no permitted discharges located 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.

The stream reach at Baptizing Creek at BPTL-1 is characterized by slow-moving pool and run habitats, with cobble and gravel bottom substrates (Figure 1). Overall habitat quality was categorized as *sub-optimal*. However, sedimentation and limited instream habitat were issues within the reach.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Tennessee River
Drainage Area (mi^2)		4
Ecoregion[a]		71h
% Landuse		
Open water		<1
Wetland	Woody	<1
Forest	Deciduous	44
	Evergreen	2
	Mixed	9
Shrub/scrub		3
Grassland/herbaceous		1
Pasture/hay		32
Cultivated crops		5
Development	Open space	3
	Low intensity	<1
Population/km^2[b]		3

a.Outer Nashville Basin
b.2000 US Census

Table 2. Physical characteristics in Baptizing Creek at BPTL-1 on June 3, 2009.

Physical Characteristics		
Width (ft)		25
Canopy cover		Shaded
Depth (ft)		
	Riffle	0.5
	Run	1.5
	Pool	2.0
% of Reach		
	Riffle	5
	Run	25
	Pool	70
% Substrate		
	Boulder	1
	Cobble	45
	Gravel	44
	Sand	5
	Silt	2
	Organic Matter	3

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 in Baptizing Creek at BPTL-1 to be in *fair* condition (Table 4).

Table 3. Results of the habitat assessment conducted in Baptizing Creek at BPTL-1 on June 3, 2009.

Habitat Assessment	% Maximum Score	Rating
Instream habitat quality	58	Marginal (41-58)
Sediment deposition	56	Marginal (41-58)
Sinuosity	53	Marginal (45-64)
Bank and vegetative stability	75	Optimal >74
Riparian buffer	88	Sub-optimal (70-90)
Habitat assessment score	**159**	
% Maximum score	**66**	**Sub-optimal (59-70)**

Table 4. Results of the macroinvertebrate bioassessment conducted in Baptizing Creek at BPTL-1 on June 3, 2009.

Macroinvertebrate Assessment		
	Results	**Scores**
Taxa richness and diversity measures		**(0-100)**
# EPT taxa	13	39
Shannon Diversity	3.85	53
Taxonomic composition measures		
% EPT minus Baetidae and Hydropsychidae	33	71
% Non-insect taxa	18	22
Functional feeding group		
% Predator Individuals	6	19
Community tolerance		
% Tolerant taxa	43	16
WMB-I Assessment Score	**---**	**37**
WMB-I Assessment Rating		**Fair (29-43)**

WATER CHEMISTRY

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) during March through October of 2009 to help identify any stressors to the biological communities.

In situ measurements indicated that Baptizing Creek at BPTL-1 was meeting requirements for its *F&W* use classification during the 2009 sampling year. However, median values of dissolved reactive phosphorus, and chlorides were above the 90th percentile of all reference reach data collected in the Outer Nashville Basin ecoregion (71h). Specific conductivity and hardness values were above all median values for reference reach data collected in this ecoregion. Estimated concentrations of total aluminum and total manganese were also higher than expected.

SUMMARY

Bioassessment results indicated the macroinvertebrate community to be in *fair* condition. However, concentrations of dissolved reactive phosphorus, chlorides, specific conductivity, hardness, total aluminum, and total manganese were elevated as compared to data from ADEM's least-impaired reference reaches in ecoregion 71h. Monitoring should continue to ensure that water quality and biological conditions remain stable.

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Table 5. Summary of water quality data collected March-October, 2009. Minimum (Min) and maximum (Max) values calculated using minimum detection limits (MDL). 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
Physical						
Temperature (°C)	8	11.3	25.1	21.2	19.4	4.4
Turbidity (NTU)	8	4.1	7.4	5.9	5.7	1.3
J Total Dissolved Solids (mg/L)	6	10.0	122.0	96.0	80.0	47.7
Total Suspended Solids (mg/L)	6	1.0	8.0	2.0	3.0	2.5
Specific Conductance (µmhos)	8	139.0	182.9	166.2 G	159.8	17.2
Hardness (mg/L)	3	62.6	88.1	66.0 G	72.2	13.8
Alkalinity (mg/L)	6	57.6	82.0	65.4	68.2	10.8
Stream Flow (cfs)	4	4.9	11.5	6.4	7.3	2.9
Chemical						
Dissolved Oxygen (mg/L)	8	7.2	10.3	8.2	8.5	1.1
pH (su)	8	7.3	7.8	7.6	7.6	0.1
J Ammonia Nitrogen (mg/L)	6	< 0.006	0.014	0.007	0.006	0.002
J Nitrate+Nitrite Nitrogen (mg/L)	6	0.460	0.657	0.554	0.551	0.072
J Total Kjeldahl Nitrogen (mg/L)	6	< 0.141	0.290	0.254	0.220	0.082
J Total Nitrogen (mg/L)	6	< 0.638	0.947	0.730	0.771	0.113
Dissolved Reactive Phosphorus (mg/L)	6	0.026	0.041	0.034 M	0.033	0.006
J Total Phosphorus (mg/L)	6	0.043	0.069	0.049	0.052	0.011
CBOD-5 (mg/L)	6	< 2.0	< 2.0	1.0	1.0	0.0
Chlorides (mg/L)	6	2.6	2.8	2.7 M	2.7	0.1
Atrazine (µg/L)	2	< 0.06	< 0.06	0.03	0.03	0.00
Total Metals						
J Aluminum (mg/L)	3	0.063	0.239	0.138 M	0.147	0.088
J Iron (mg/L)	3	0.122	0.188	0.135	0.148	0.035
J Manganese (mg/L)	3	0.034	0.046	0.044 M	0.041	0.006
Dissolved Metals						
J Aluminum (mg/L)	3	< 0.019	0.029	0.010	0.016	0.011
Antimony (µg/L)	3	< 0.7	2.0	0.4	0.6	0.4
Arsenic (µg/L)	3	< 0.4	1.6	0.2	0.4	0.4
Cadmium (mg/L)	3	< 0.003	< 0.003	0.002	0.002	0.000
Chromium (mg/L)	3	< 0.013	< 0.013	0.006	0.006	0.000
Copper (mg/L)	3	< 0.013	< 0.013	0.006	0.006	0.000
J Iron (mg/L)	3	< 0.014	0.020	0.019	0.015	0.007
Lead (µg/L)	3	< 0.6	< 1.0	0.5	0.4	0.1
J Manganese (mg/L)	3	0.022	0.026	0.023	0.024	0.002
Mercury (µg/L)	3	< 0.1	< 0.1	0.0	0.0	0.0
J Nickel (mg/L)	3	< 0.004	0.007	0.002	0.004	0.003
Selenium (µg/L)	3	< 0.4	1.5	0.2	0.4	0.3
Silver (mg/L)	3	< 0.002	< 0.002	0.001	0.001	0.000
Thallium (µg/L)	3	< 0.4	0.5	0.2	0.2	0.0
J Zinc (mg/L)	3	< 0.003	0.012	0.002	0.005	0.006
Biological						
Chlorophyll a (µg/L)	6	0.53	1.60	1.20	1.11	0.49
J Fecal Coliform (col/100 mL)	6	45	540	325	289	184

N=# samples; J= estimate; M= value > 90th percentile of all verified ecoregional reference reach data collected within ecoregions 71h; G= value > median values of all verified reference reach data collected within ecoregion 71h