Alabama Department of Environmental Management

§303(d)/TMDL Monitoring Site

Rivers and Streams Monitoring Program

2009 Monitoring Summary

Brindley Creek in Cullman County at State Highway 69 (34.20947/-85.69371)

BACKGROUND

Brindley Creek, from Broglen River to its source, was placed on Alabama's Clean Water Act (CWA) 1998 §303(d) list of impaired waters for not meeting its *Public Water Supply* (PWS) water use classification. It was listed for ammonia, nutrients, organic enrichment/dissolved oxygen, and pathogens from urban runoff/ storm sewers. The Alabama Department of Environmental Management (ADEM) monitored Brindley Creek at BINC-192 to support development of Total Maximum Daily Loads (TMDL) to address these impairments.

Figure 1. Brindley Creek at BINC-192, June 2, 2009.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Brindley Creek at BINC-192 is located within the Southern Table Plateaus ecoregion in Cullman County (Figure 1). Based on the 2006 National Land Cover Dataset, landuse within the watershed was predominantly pasture with cultivated crops and forest (21%). As of September 1, 2012, ADEM's NPDES Management System database shows a total of seven permitted discharges 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. Brindley Creek at BINC-192 is a riffle-run stream with a mixture of boulder, cobble, and gravel substrates. Habitat quality and availability was rated as *optimal* for supporting diverse aquatic macroinvertebrate communities.

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 reference reaches in the same ecoregion. The final score is the average of all individual metric scores. Metric results indicated the macroinvertebrate community to be in *poor* community condition (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Black Warrior R
Drainage Area (mi^2)		14
Ecoregion[a]		68d
% Landuse		
Open water		1
Wetland	Woody	1
	Emergent herbaceous	
Forest	Deciduous	13
	Evergreen	2
	Mixed	6
Shrub/scrub		6
Grassland/herbaceous		1
Pasture/hay		48
Cultivated crops		16
Development	Open space	5
	Low intensity	2
	Moderate intensity	1
	High intensity	<1
Barren		13
Population/km^2[b]		46
# NPDES Permits[c]	**TOTAL**	7
Construction Stormwater		7

a. Southern Table Plateaus

b. 2000 US Census

c. #NPDES permits downloaded from ADEM's NPDES Management System database, September 1, 2012.

Table 2. Physical characteristics of Brindley Creek at BINC-192, June 2, 2009.

Physical Characteristics		
Width (ft)		25
Canopy Cover		Shaded
Depth (ft)		
	Riffle	1.0
	Run	2.0
	Pool	3.0
% of Reach		
	Riffle	10
	Run	70
	Pool	20
% Substrate		
	Bedrock	5
	Boulder	30
	Cobble	30
	Gravel	25
	Sand	5
	Silt	2
	Organic Matter	3

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Table 3. Results of the habitat assessment conducted on Brindley Creek at BINC-192, June 2, 2009.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	74	Optimal >70
Sediment Deposition	68	Sub-optimal (59-70)
Sinuosity	80	Sub-optimal (65-84)
Bank and Vegetative Stability	69	Sub-optimal (60-74)
Riparian Buffer	83	Sub-optimal (70-89)
Habitat Assessment Score	**177**	
% Maximum Score	**74**	**Optimal >70**

Table 4. Results of the macroinvertebrate bioassessment conducted in Brindley Creek at BINC-192, June 2, 2009.

Macroinvertebrate Assessment		
	Results	**Scores**
Taxa richness measures		**(0-100)**
# EPT taxa	7	13
Taxonomic composition measures		
% Non-insect taxa	16	33
% Dominant taxon	38	25
% EPC taxa	21	27
Functional feeding group measures		
% Predators	11	41
Tolerance measures		
% Taxa as Tolerant	40	24
WMB-I Assessment Score	**---**	**27**
WMB-I Assessment Rating		**Poor (20-38)**

Table 5. Summary of water quality data collected March-October, 2009. 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
Physical						
Temperature (°C)	10	12.5	23.9	19.6	18.7	4.2
Turbidity (NTU)	10	6.0	51.3	8.1	13.8	13.7
Total Dissolved Solids (mg/L)	8	49.0	145.0	85.0	87.0	30.8
Total Suspended Solids (mg/L)	8	2.0	99.0	6.5	18.4	33.0
Specific Conductance (µmhos)	10	85.0	124.0	105.0 G	104.9	12.7
J Alkalinity (mg/L)	8	14.6	46.2	24.3 M	28.8	12.0
Stream Flow (cfs)	8	2.4	50.2	12.1	18.2	17.0
Chemical						
Dissolved Oxygen (mg/L)	10	7.6	11.3	8.7	9.0	1.3
pH (su)	10	6.1	7.4	7.2	7.1	0.4
B Ammonia Nitrogen (mg/L)	3	< 0.006	0.066	0.057	0.042	0.034
B Nitrate+Nitrite Nitrogen (mg/L)	3	0.529	2.110	0.800	1.146	0.846
B Total Kjeldahl Nitrogen (mg/L)	3	< 0.089	1.556	0.667	0.756	0.760
B Total Nitrogen (mg/L)	3	< 0.574	3.666	1.467	1.902	1.592
B Total Phosphorus (mg/L)	3	0.047	0.361	0.147 M	0.185	0.160
J CBOD-5 (mg/L)	8	< 1.0	1.4	0.5	0.7	0.4
Chlorides (mg/L)	8	3.3	13.2	6.2	6.7	3.4
Biological						
Chlorophyll a (ug/L)	8	< 1.00	18.70	3.42 M	4.62	5.94

B=samples excluded due to laboratory QC concerns; G=value higher than median concentration of all verified ecoregional reference reach data collected in the ecoregion 68d; J=estimate; M=value >90% of all verified ecoregional reference reach data collected in the ecoregion 68d; N=# samples.

WATER CHEMISTRY

In situ measurements and water samples were collected monthly during March through October of 2009 to help identify any stressors to the biological communities. Water chemistry results are summarized in Table 5. Median conductivity and total phosphorus concentrations were higher than background levels based on data from reference reaches in ecoregion 68d. The concentration of chlorophyll *a*, which is used as an index of in-stream algal biomass, was also higher than expected, based on reference reach data. Stream flow ranged from 2.4-50.2 cfs during March through October.

SUMMARY

As part of the assessment process, ADEM will review the monitoring information presented in this report, along with all other available data.

Results from the 2009 bioassessment indicated the macroinvertebrate community in Brindley Creek at BINC-192 to be in *poor* condition; however, habitat quality and availability was rated as *optimal* for supporting diverse aquatic macroinvertebrate communities. The high phosphorus content of the stream may have led to increased algal growth (chlorophyll *a*) and impairment to biological communities. The extreme flow conditions may also have impacted the macroinvertebrate community.

FOR MORE INFORMATION, CONTACT:
Alicia K. Phillips, ADEM Environmental Indicators Section
1350 Coliseum Boulevard Montgomery, AL 36110
(334) 260-2797 akphillips@adem.state.al.us