Alabama Department of Environmental Management

Ambient Monitoring Site

Rivers and Streams Monitoring Program

2011 Monitoring Summary

Fair

Bodka Creek at Alabama Highway 17 in Sumter County (32.80679/-88.31213)

BACKGROUND

Bodka Creek at BDKS-48 is one of a network of 94 ambient sites monitored annually by the Alabama Department of Environmental Management (ADEM) to identify long-term trends in water quality and to provide data for the development of Total Maximum Daily Loads (TMDL) and water quality criteria.

Bodka Creek was also selected for biological and water quality monitoring as part of the 2011 Assessment of the Escatawpa, Mobile, and Tombigbee (EMT) River Basins. The objectives of the EMT Basin Assessments were to assess the biological integrity of each monitoring site and to estimate overall water quality within the EMT basin group. A habitat and a macroinvertebrate assessment were conducted at Bodka Creek at BDKS-48 on May 19, 2011.

Figure 1. Bodka Creek at BDKS-48, May 19, 2011.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Bodka Creek at BDKS-48 is a *Fish and Wildlife (F&W)* stream located in Sumter County. Based on the 2006 National Land Cover Dataset, landuse within the watershed is primarily forested (49%) with some wetland and pasture. Population density is low, and less than six percent of the area is developed. As of September 1, 2012, eight outfalls are 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. Bodka Creek at BDKS-48 is a low gradient, glide-pool stream located in the Blackland Prairie ecoregion (65a) (Figure 1). Benthic substrate consists primarily of hard pan clay. Overall habitat quality was categorized as *optimal* for supporting 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. The final score is the average of all metric scores. Metric results indicated the macroinvertebrate community in Bodka Creek at BDKS-48 to be in *fair* condition (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Upper Tombigbee
Drainage Area (mi^2)		159
Ecoregion[a]		65a
% Landuse		
Open water		1
Wetland	Woody	17
	Emergent herbaceous	1
Forest	Deciduous	12
	Evergreen	27
	Mixed	10
Shrub/scrub		8
Grassland/herbaceous		4
Pasture/hay		14
Cultivated crops		1
Development	Open space	4
	Low intensity	<1
	Moderate intensity	<1
	High intensity	<1
Barren		<1
Population/km^2[b]		4
# NPDES Permits[c]		8
401 Water Quality Certification		1
Industrial Individual		1
Municipal Individual		6

a. Blackland Prairie

b. 2000 US Census

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

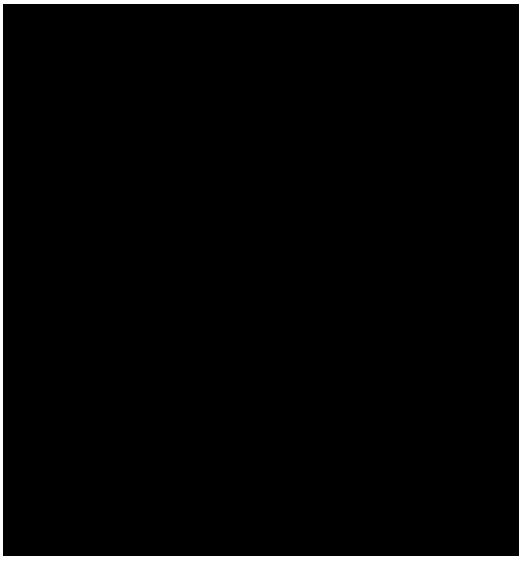

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Table 3. Results of the habitat bioassessment conducted on Bodka Creek at BDKS-48, May 19, 2011.

Habitat Assessment	% Maximum Score	Rating
Instream Habitat Quality	50	Marginal (40-52)
Sediment Deposition	86	Optimal (>65)
Sinuosity	38	Poor (<45)
Bank and Vegetative Stability	60	Sub-optimal (60-74)
Riparian Buffer	90	Optimal (>89)
Habitat Assessment Score	**150**	
% Maximum Score	**68**	**Optimal (>65)**

Table 4. Results of the macroinvertebrate bioassessment conducted in Bodka Creek at BDKS-48, May 19, 2011.

Macroinvertebrate Assessment			
	Results	Score	Rating
Taxa richness measures			
# EPT genera	15	60	Good (57-78)
Taxonomic composition			
% Non-insect taxa	28	14.8	Very Poor (<30.8)
% Plecoptera	1	3.8	Fair (3.8-5.6)
% Dominant taxa	17	99.8	Excellent (>85.3)
Functional composition measures			
% Predators	7	41.3	Fair (30.2-45.2)
Tolerance measures			
Beck's community tolerance	9	40.9	Good (31.9-65.9)
% Nutrient tolerant organisms	28	71.2	Fair (50.9-76.2)
WMB-I Assessment Score	**--**	**47**	**Fair (38-56)**

WATER CHEMISTRY

Results of water chemistry are presented in Table 5. In situ measurements were collected collected monthly, semi-monthly, or quarterly during March through October of 2011 to help identify any stressors to the biological communities. Although samples of total dissolved arsenic did exceed human health criterion in Bodka Creek, ADEM criteria for arsenic are expressed as dissolved trivalent arsenic (arsenite-As III). Presently, studies are being conducted in order to provide a better understanding of the prevalence and areal distribution of dissolved trivalent arsenic to total arsenic in the State of Alabama. Upon conclusion of the studies, Bodka Creek will be reassessed for arsenic violations.

Median specific conductance and hardness were higher than expected for ecoregion 65a based on the median values of all samples collected at least impaired reference reaches. Also, median total aluminum concentrations were higher than anticipated for the ecoregion. Turbidity was > 50 NTU above background levels during one of six sampling events (March 9, 2011). Stream flow at the time of sampling was above normal, measuring 4,180 cfs according to the USGS gauging station at the site.

SUMMARY

As part of the assessment process, ADEM will review the monitoring information presented in this report, along with all other available data. While overall habitat quality was categorized as *optimal* in the reach, bioassessment results indicated the macroinvertebrate community in Bodka Creek at BDKS-48 to be in *fair* condition. Water quality analyses indicated potentially elevated dissolved arsenic concentrations at the site. Further monitoring is needed to ensure biological conditions remain favorable.

Table 5. Summary of water quality data collected during 2011. 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	E
Physical							
Temperature (°C)	5	12.7	29.4	21.5	21.7	6.7	
Turbidity (NTU)	5	8.0	249.0 T	29.8	73.4	100.0	
Total Dissolved Solids (mg/L)	4	104.0	188.0	157.0	151.5	35.0	
Total Suspended Solids (mg/L)	4	5.0	161.0	18.0	50.5	74.4	
Specific Conductance (µmhos)	5	107.9	392.1	171.0 G	222.9	123.6	
Hardness (mg/L)	4	52.6	118.0	69.4 G	77.4	29.2	
Alkalinity (mg/L)	4	34.3	117.0	59.2	67.4	36.4	
Stream Flow (cfs)	5	3.4	4180.0	66.0	870.0	1850.8	
Chemical							
Dissolved Oxygen (mg/L)	5	5.1	14.0	7.9	8.8	3.3	
pH (su)	5	6.9	8.2	7.8	7.7	0.5	
Ammonia Nitrogen (mg/L)	4	< 0.005	0.021	0.002	0.007	0.009	
Nitrate+Nitrite Nitrogen (mg/L)	4	0.031	0.848	0.127	0.283	0.380	
Total Kjeldahl Nitrogen (mg/L)	4	0.642	1.320	0.877	0.929	0.288	
Total Nitrogen (mg/L)	4	0.804	2.168	0.938	1.212	0.641	
Dissolved Reactive Phosphorus (mg/L)	4	0.025	0.091	0.048	0.053	0.033	
Total Phosphorus (mg/L)	4	0.078	0.245	0.125	0.143	0.076	
J CBOD-5 (mg/L)	4	< 2.0	2.1	1.0	1.3	0.6	
Chlorides (mg/L)	4	1.1	6.5	3.4	3.6	2.3	
Total Metals							
Aluminum (mg/L)	4	0.755	2.510	1.360 M	1.496	0.779	
Iron (mg/L)	4	1.060	2.310	1.205	1.445	0.585	
Manganese (mg/L)	4	0.081	0.192	0.089	0.113	0.053	
Dissolved Metals							
J Aluminum (mg/L)	4	< 0.043	0.168	0.086	0.091	0.060	
J Antimony (µg/L)	4	< 1.9	< 1.9	0.9	0.9	0.0	
J Arsenic (µg/L)	4	< 1.4	1.6 H	0.7	0.9	0.5	1
J Cadmium (mg/L)	4	< 0.001	< 0.001	0.000	0.000	0.000	
Chromium (mg/L)	4	< 0.009	< 0.009	0.004	0.004	0.000	
Copper (mg/L)	4	< 0.020	< 0.020	0.010	0.010	0.000	
J Iron (mg/L)	4	0.065	0.172	0.147	0.133	0.048	
J Lead (µg/L)	4	< 0.9	< 0.9	0.5	0.5	0.0	
J Manganese (mg/L)	4	< 0.001	0.050	0.036	0.030	0.021	
Mercury (µg/L)	4	< 0.01	< 0.01	0.0	0.0	0.0	
Nickel (mg/L)	4	< 0.042	< 0.042	0.021	0.021	0.000	
J Selenium (µg/L)	4	< 1.3	< 1.3	0.7	0.7	0.0	
J Silver (mg/L)	4	< 0.001	< 0.001	0.000	0.000	0.000	
J Thallium (µg/L)	4	< 1.1	< 1.1	0.5	0.5	0.0	
Zinc (mg/L)	4	< 0.012	< 0.012	0.006	0.006	0.000	
Biological							
Chlorophyll a (ug/L)	4	< 0.10	2.14	1.74	1.42	0.99	
J E. coli (col/100mL)	4	160	2420	384	836	1069	

E=# samples that exceeded criteria; G=value higher than median concentration of all verified ecoregional reference reach data collected in the ecoregion 65a; H=*F&W* human health criterion exceeded; J=estimate; M=value >90% of all verified ecoregional reference reach data collected in the ecoregion 65a; N=# samples; T=value exceeds 50 NTU above the 90th percentile of all verified ecoregional reference reach data collected in the ecoregion 65a.

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