

2011 Monitoring Summary



Bilbo Creek at Washington County Road 35 (31.26100/-88.03860)

BACKGROUND

A 29.27 mile segment of Bilbo Creek from its source to the Tombigbee River has been on Alabama's Clean Water Act (CWA) §303(d) list of impaired waters since 2004. In 2004, it was listed for impairments caused by organic enrichment/dissolved oxygen (OE/DO), and in 2006, it was listed for mercury. The 2011 data will be used to develop Total Maximum Daily Load (TMDL) to address the impairment caused by OE/DO.

The Alabama Department of Environmental Management (ADEM) also selected the Bilbo Creek watershed for biological and water quality monitoring as part of the 2011 Assessment of the Escatawpa, Mobile, and Tombigbee (EMT) River Basin. The objectives of the EMT River Basin Assessments were to assess the biological integrity of each monitoring site and to estimate overall water quality within the EMT River basin group. A habitat and a macroinvertebrate assessment were conducted on Bilbo Creek at BLBW-1 on September 13, 2011.



Figure 1. Bilbo Creek at BLBW-1, September 21, 2011.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Bilbo Creek at BLBW-1 is a *Swimming/Fish & Wildlife (S/F&W)* stream located in Washington County. Based on the 2006 National Land Cover Dataset, landuse within the watershed is primarily forest (63%). As of September 1, 2012, a total of 15 NPDES permits have been issued in 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. Bilbo Creek at BLBW-1 is a glide-pool stream located in the Southern Pine Plains and Hills ecoregion (65f) (Figure 1). Typical of stream reaches in this ecoregion, benthic substrate consists primarily of organic matter (e.g., snags and leaf packs) and sand. Overall habitat quality was rated as *optimal* for supporting a diverse biological community.

BIOASSESSMENT RESULTS

Benthic macroinvertebrate communities were sampled using ADEM's Intensive Multi-habitat Bioassessment methodology (WMB-I). The WMB-I measures taxonomic richness, community composition, and community tolerance to assess the overall health of the macroinvertebrate community. Each score is based on a 100 point scale. The final score is the average of all individual metric scores. The metric results indicated the macroinvertebrate community to be in *fair* condition (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		Lower Tombigbee River
Basin		
Drainage Area (mi²)		66
Ecoregion^a		65f
% Landuse		
Open water		<1
Wetland	Woody	8
	Emergent herbaceous	<1
Forest	Deciduous	4
	Evergreen	35
	Mixed	24
Shrub/scrub		16
Grassland/herbaceous		4
Pasture/hay		3
Cultivated crops		<1
Development	Open space	5
	Low intensity	<1
	Moderate intensity	<1
Barren		<1
Population/km^{2b}		8
# NPDES Permits^c	TOTAL	15
	Construction Stormwater	6
	Mining	1
	Municipal Individual	6
	Underground Injection Control	2

a. Southern Pine Plains & Hills

b. 2000 US Census

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

Table 2. Physical Characteristics of Bilbo Creek at BLBW-1, September 13, 2011.

Physical Characteristics	
Width (ft)	12
Canopy cover	Shaded
Depth (ft)	
	Run 2.0
	Pool 2.5
% of Reach	
	Run 30
	Pool 70
% Substrate	
	Gravel 2
	Sand 30
	Silt 5
	Organic Matter 63

Table 3. Results of the habitat assessment conducted on Bilbo Creek at BLBW-1 on September 13, 2011.

Habitat Assessment	% Maximum Score	Rating
Instream Habitat Quality	78	Optimal >65
Sediment Deposition	78	Optimal >65
Sinuosity	33	Poor <45
Bank and Vegetative Stability	49	Marginal (35-59)
Riparian Buffer	90	Optimal >89
Habitat Assessment Score	155	
% Maximum score	70	Optimal >65

Table 4. Results of the macroinvertebrate bioassessment conducted in Bilbo Creek at BLBW-1 on September 13, 2011.

Macroinvertebrate Assessment		
	Results	Scores (0-100)
Taxa richness and diversity measures		
% EPC taxa	6	0
% Trichoptera & Chironomidae Taxa	46	25
Taxonomic composition measures		
% EP Individuals	0	0
Functional feeding group		
% Collector-Filterer Individuals	14	83
Community tolerance		
% Nutrient Tolerant individuals	15	86
WMB-I Assessment Score	---	39
WMB-I Assessment Rating		Fair (31-45)

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. When possible, in situ measurements and water samples were collected monthly, semi-monthly (metals), or quarterly (pesticides, herbicides, atrazine, and semi-volatile organics) during March through October to help identify any stressors to the biological communities. Stream flow was not measured during four station visits due to non-wadeable conditions caused by heavy rainfall in the watershed. Median concentrations of specific conductance and median total iron concentrations were higher than expected for streams in the Southern Pine Plains and Hills ecoregion (65f). Dissolved oxygen concentrations were below *S/F&W* use classification criterion during seven sampling events (May 10, May 24, June 1, July 6, August 1, and October 18), and lead concentrations exceeded use class criterion during one sampling event (October 18). Also, pH values were below criterion during all ten sampling events, however, low pH is characteristic of streams in ecoregion 65f. *E. coli* exceeded criteria for *S/F&W* streams and arsenic exceeded Human Health criteria during one sampling event (April 5), but a large storm event and high flows during sampling may have contributed to these exceedances. Pesticides, herbicides, atrazine, and semi-volatile organics were not detected in the two samples collected (June 1, October 18).

SUMMARY

Overall habitat quality was categorized as *optimal* for supporting a diverse macroinvertebrate community, however, bioassessment results indicated the macroinvertebrate community in Bilbo Creek at BLBW-1 to be in *fair* condition. Water chemistry analyses showed low dissolved oxygen and pH levels, high conductivity, and high concentrations of dissolved iron, arsenic, lead, and *E. coli* to be potential causes of stressors to the biological community in the Bilbo Creek watershed.

Table 5. Summary of water quality data collected March-October, 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	Median	Avg	SD	E
Physical							
Temperature (°C)	10	12.9	26.2	22.4	21.0	4.0	
Turbidity (NTU)	11	2.1	11.4	2.8	4.6	3.2	
Total Dissolved Solids (mg/L)	8 <	1.0	72.0	50.0	45.6	21.8	
Total Suspended Solids (mg/L)	8 <	1.0	86.0	0.8	11.5	30.1	
Specific Conductance (µmhos)	10	28.6	65.4	31.0 ^G	35.6	11.2	
Hardness (mg/L)	4	3.9	6.0	5.2	5.1	0.9	
Alkalinity (mg/L)	8 <	2.4	4.8	1.2	1.9	1.4	
Stream Flow (cfs)	7	0.6	6.8	2.0	2.7	2.1	
Chemical							
Dissolved Oxygen (mg/L)	10	1.9	8.4	3.6 ^C	4.3	2.4	7
pH (su)	10	4.1	5.2	5.0 ^C	4.8	0.4	10
Ammonia Nitrogen (mg/L)	8 <	0.005	< 0.007	0.002	0.003	0.000	
^J Nitrate+Nitrite Nitrogen (mg/L)	8 <	0.004	0.035	0.012	0.014	0.012	
Total Kjeldahl Nitrogen (mg/L)	8 <	0.107	0.645	0.310	0.325	0.164	
^J Total Nitrogen (mg/L)	8 <	0.056	< 0.647	0.340	0.339	0.163	
^J Dissolved Reactive Phosphorus (mg/L)	8	0.008	0.011	0.008	0.009	0.001	
^J Total Phosphorus (mg/L)	8	0.008	0.013	0.010	0.011	0.002	
^J CBOD-5 (mg/L)	8 <	2.0	< 2.0	1.0	1.0	0.0	
Chlorides (mg/L)	8	3.6	6.6	3.9	4.3	1.0	
Atrazine (µg/L)	2 <	0.02	< 0.02	0.01	0.01	0.00	
Total Metals							
^J Aluminum (mg/L)	4	0.146	0.329	0.176	0.207	0.083	
Iron (mg/L)	4	0.796	2.170	1.545 ^M	1.514	0.586	
^J Manganese (mg/L)	4	0.022	0.031	0.028	0.027	0.004	
Dissolved Metals							
^J Aluminum (mg/L)	4	0.047	0.210	0.073	0.101	0.074	
^J Antimony (µg/L)	4 <	1.9	< 1.9	0.9	0.9	0.0	
^J Arsenic (µg/L)	4 <	1.4	1.8 ^H	0.7	1.0	0.6	1
^J Cadmium (mg/L)	4 <	0.000	0.000	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	
Iron (mg/L)	4	0.283	0.422	0.370	0.362	0.058	
Lead (µg/L)	4 <	0.9	22.0 ^S	0.5	5.8	10.8	1
^J Manganese (mg/L)	4	0.021	0.029	0.027	0.026	0.004	
Mercury (µg/L)	4 <	0.0	< 0.0	0.0	0.0	0.0	
Nickel (mg/L)	4 <	0.042	< 0.042	0.021	0.021	0.000	
Selenium (µg/L)	4 <	1.3	< 1.3	0.7	0.7	0.0	
Silver (mg/L)	4 <	0.000	< 0.000	0.000	0.000	0.000	
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 (µg/L)	8 <	0.10	2.67	0.92	1.18	1.16	
^J <i>E. coli</i> (col/100mL)	4	9	249 ^C	45	86	109	1

C=*S/F&W* criterion exceeded; E=# samples that exceeded criteria; G=value higher than median concentration of all verified ecoregional reference reach data collected in the ecoregion 65f; H=Human Health criterion exceeded; J=estimate; M=value >90% of all verified ecoregional reference reach data collected in the ecoregion 65f; N=# samples; S=*S/F&W* hardness-adjusted aquatic life use criteria exceeded.

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