

2014 Monitoring Summary



Boggy Branch upstream of Atmore WWTP discharge in Escambia County (31.01610/-87.51559)

BACKGROUND

Two segments of Boggy Branch are on Alabama's 2014 §303(d) list of impaired waters. The 0.2 mile segment of Boggy Branch, from Atmore WWTP upstream to Masland Carpets, has been listed since 1998 for impairments from organic enrichment/dissolved oxygen, metals (Zinc), and chlorides from industrial sources. In 2006, the 1.54 mile segment from Brushy Creek upstream to Atmore WWTP was added for impairments from pathogens and metals (lead, copper) from industrial and municipal sources. The Alabama Department of Environmental Management (ADEM) monitored Boggy Branch at BOB-2, just upstream of the Atmore WWTP, to monitor conditions within this segment of Boggy Branch, and to collect pathogen and metals data in support of 2016 TMDL development.



Figure 1. Boggy Branch at BOB-2, June 18, 2014.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Boggy Branch is a *Fish & Wildlife (F&W)* stream located in the Southern Pine Plains and Hills ecoregion of Escambia County. Based on the 2011 National Land Cover Dataset, the dominant landuse within the watershed is primarily development (37%). As of April 1, 2016, the ADEM has issued three NPDES outfalls in this watershed, two of which are industrial permits.

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. Boggy Branch at BOB-2 (Figure 1) is a low-gradient, sand and gravel bottomed stream. Habitat quality and availability was rated as *sub-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 least-impaired reference reaches in the same ecoregion. The final score is the average of all individual metric scores. The final score indicated the biological community to be in *poor* condition (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Perdido R
Drainage Area (mi ²)		1
Ecoregion ^a		65F
% Landuse ^b		
Wetland	Woody	6%
	Emergent herbaceous	1%
Forest	Deciduous	1%
	Evergreen	11%
	Mixed	2%
Shrub/scrub		17%
Grassland/herbaceous		9%
Pasture/hay		11%
Cultivated crops		2%
Development	Open space	18%
	Low intensity	12%
	Moderate intensity	5%
	High intensity	2%
Barren		2%
Population/km ^{2c}		159
# NPDES Permits ^d	TOTAL	3
	Construction	1
	Industrial General	2

a.Southern Pine Plains & Hills

b.2011 National Land Cover Dataset

c.2010 US Census

d.#NPDES outfalls downloaded from ADEM's NPDES Management System database, April 1, 2016.

Table 2. Physical characteristics of Boggy Branch at BOB-2, June 18, 2014.

Physical Characteristics		
Width (ft)		12
Canopy Cover		Shaded
Depth (ft)		
	Run	1.0
	Pool	2.0
% of Reach		
	Run	90
	Pool	10
% Substrate		
	Clay	2
	Gravel	27
	Sand	65
	Silt	1
	Organic Matter	5

Table 3. Results of the habitat assessment conducted on Boggy Branch at BOB-2, June 18, 2014.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	53	Marginal (31-<55)
Sediment Deposition	60	Sub-Optimal (55-79)
Sinuosity	58	Sub-Optimal (55-79)
Bank and Vegetative Stability	73	Sub-Optimal (58-79)
Riparian Buffer	90	Optimal (>84)
Habitat Assessment Score	121	
% Maximum Score	71	Sub-Optimal (57-80)

Table 4. Results of the macroinvertebrate bioassessment conducted in Boggy Branch at BOB-2, June 18, 2014.

Macroinvertebrate Assessment			
	Results	Scores	
Taxa richness and diversity measures		(0-100)	
% EPC taxa	17	13	
% Trichoptera & Chironomidae Taxa	31	78	
Taxonomic composition measures			
% EP Individuals	1	0	
Functional feeding group			
% Collector-Filterer Individuals	49	11	
Community tolerance			
% Nutrient Tolerant individuals	69	0	
WMB-I Assessment Score	---	20	
WMB-I Assessment Rating		Poor (15-30)	

WATER CHEMISTRY

Results of water chemistry are presented in Table 5. In situ measurements and water samples were collected monthly from April to November of 2014 to help identify any stressors to the biological communities. Additionally, intensive *E. coli* monitoring was conducted during the sampling period.

Dissolved oxygen exceeded the *F&W* water use criteria on September 4th and 18th, 2014. Stream pH exceeded was slightly acidic on September 4th, 2014. *E. coli* exceeded the *F&W* water use criteria on four separate occasions. The geometric mean of five *E. coli* samples collected in June exceeded the *F&W* water use criterion.

Specific conductance and hardness values were higher than the median concentration of all verified ecoregional reference reach data collected in ecoregion 65f. Total dissolved solids, alkalinity, nutrients and chloride values were greater than 90% of all verified ecoregional reference reach data collected in the Southern Pine Plains & Hills ecoregion. Dissolved antimony exceeded the human health criterion for the *Fish & Wildlife* use classification.

SUMMARY

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

Bioassessment results indicated the macroinvertebrate community to be in *poor* condition. Overall habitat quality was categorized as *sub-optimal*. Results from water quality sampling indicated multiple criteria exceedances and that conductivity and nutrient concentrations were higher than expected based on the 90th percentile of data collected at least impaired reference reaches in the Southern Pine Plains & Hills ecoregion.

Table 5. Summary of water quality data collected April-November, 2014. 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	Q
Physical								
Temperature (°C)	14	8.7	24.8	23.2	21.9	4.1		
Turbidity (NTU)	18	1.9	8.8	4.2	4.6	1.9		
Total Dissolved Solids (mg/L)	8	55.0	199.0	109.0 ^M	118.9	55.2		
Total Suspended Solids (mg/L)	8	<1.0	12.0	1.5	2.9	4.0		
Specific Conductance (µmhos)	14	62.2	304.2	177.6 ^G	180.8	86.6		
Hardness (mg/L)	8	27.8	83.0	41.8 ^G	47.2	20.3		
Alkalinity (mg/L)	8	23.4	84.1	36.8 ^M	47.0	24.4		
Stream Flow (cfs)	15	0.9	2.7	1.8	1.6	0.6		
Chemical								
Dissolved Oxygen (mg/L)	13	4.4 ^C	7.1	5.6	5.6	0.6	2	
pH (su)	14	5.8 ^C	6.8	6.4	6.4	0.3	1	
^J Ammonia Nitrogen (mg/L)	8	<0.006	0.355	0.039	0.088	0.121		
Nitrate+Nitrite Nitrogen (mg/L)	8	0.169	3.850	1.093 ^M	1.551	1.413		
Total Kjeldahl Nitrogen (mg/L)	8	<0.054	1.140	0.610 ^M	0.608	0.340		
Total Nitrogen (mg/L)	8	<0.599	4.604	1.892 ^M	2.159	1.397		
Dissolved Reactive Phosphorus (mg/L)	8	0.028	0.177	0.126 ^M	0.112	0.052		
Total Phosphorus (mg/L)	8	0.117	0.307	0.201 ^M	0.192	0.064		
CBOD-5 (mg/L)	8	<2.0	<2.0	1.0	1.0	0.0		
Chlorides (mg/L)	8	7.1	26.3	15.7 ^M	16.1	7.8		
Total Metals								
^J Aluminum (mg/L)	6	0.069	0.268	0.124	0.156	0.083		
Iron (mg/L)	6	0.354	1.020	0.654	0.684	0.268		
^J Manganese (mg/L)	6	0.026	0.081	0.030	0.041	0.022		
Dissolved Metals								
^J Aluminum (mg/L)	6	<0.050	0.195	0.038	0.065	0.066		
^J Antimony (µg/L)	8	<0.2	8.1 ^H	1.0	2.1	2.7	1	
^J Arsenic (µg/L)	8	0.4	0.8	0.5	0.6	0.1		8
Cadmium (µg/L)	8	<0.246	<0.390	0.156	0.152	0.023		
^J Chromium (µg/L)	8	<0.387	1.900	0.710	0.845	0.566		
^J Copper (mg/L)	8	<0.0002	0.0010	0.0009	0.0009	0.0004		
^J Iron (mg/L)	6	0.177	0.570	0.373	0.357	0.133		
^J Lead (µg/L)	8	<0.3	1.0	0.3	0.4	0.3		
^J Manganese (mg/L)	6	0.026	0.068	0.028	0.037	0.017		
^J Nickel (mg/L)	8	0.0004	0.0020	0.0010	0.0010	0.0006		
^J Selenium (µg/L)	8	<0.4	0.5	0.2	0.2	0.1		
Silver (µg/L)	8	<0.252	<0.460	0.182	0.174	0.034		
Thallium (µg/L)	8	<0.2	<0.6	0.2	0.2	0.1		
^J Zinc (mg/L)	8	0.005	0.017	0.011	0.011	0.004		
Biological								
Chlorophyll a (ug/L)	8	0.36	4.81	2.07 ^M	2.36	1.52		
<i>E. coli</i> (col/100mL)	14	76	613 ^H	123	164	136	4	

C=*F&W* criterion violated; E=# samples that exceeded criteria; G=value higher than median concentration of all verified ecoregional reference reach data collected in the ecoregion 65f; H= *F&W* human health criterion exceeded; J=estimate; M=value >90% of all verified ecoregional reference reach data collected in the ecoregion 65f; N=# samples; Q=# samples with uncertain exceedances.

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