

# 2014 Monitoring Summary



**Boggy Branch** downstream of Atmore WWTP discharge in Escambia County (31.01569/-87.51647)

## 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-3, downstream 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-3, 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, landuse within the watershed is primarily development (38%). As of April 1, 2016, there are 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-3 (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 *very poor* condition (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
<b>Basin</b>		Perdido R
<b>Drainage Area (mi<sup>2</sup>)</b>		1
<b>Ecoregion<sup>a</sup></b>		65F
<b>% Landuse<sup>b</sup></b>		
Wetland	Woody	6%
	Emergent herbaceous	1%
Forest	Deciduous	2%
	Evergreen	11%
	Mixed	2%
Shrub/scrub		17%
Grassland/herbaceous		8%
Pasture/hay		12%
Cultivated crops		2%
Development	Open space	19%
	Low intensity	12%
	Moderate intensity	5%
	High intensity	2%
Barren		2%
<b>Population/km<sup>2c</sup></b>		155
<b># NPDES Permits<sup>d</sup></b>	<b>TOTAL</b>	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

Table 2. Physical characteristics of Boggy Branch at BOB-3, June 18, 2014.

Physical Characteristics	
<b>Width (ft)</b>	10
<b>Canopy Cover</b>	Shaded
<b>Depth (ft)</b>	
Run	1.5
Pool	2.5
<b>% of Reach</b>	
Run	45
Pool	55
<b>% Substrate</b>	
Clay	15
Gravel	25
Sand	57
Silt	1
Organic Matter	2

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

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	54	Marginal (31-<55)
Sediment Deposition	63	Sub-Optimal (55-79)
Sinuosity	58	Sub-Optimal (55-79)
Bank and Vegetative Stability	76	Sub-Optimal (58-79)
Riparian Buffer	84	Sub-Optimal (60-84)
<b>Habitat Assessment Score</b>	<b>121</b>	
<b>% Maximum Score</b>	<b>71</b>	<b>Sub-Optimal (57-80)</b>

**Table 4.** Results of the macroinvertebrate bioassessment conducted in Boggy Branch at BOB-3, June 18, 2014.

Macroinvertebrate Assessment		
	Results	Scores
<b>Taxa richness and diversity measures</b>		<b>(0-100)</b>
% EPC taxa	20	21
% Trichoptera & Chironomidae Taxa	52	4
<b>Taxonomic composition measures</b>		
% EP Individuals	1	0
<b>Functional feeding group</b>		
% Collector-Filterer Individuals	87	0
<b>Community tolerance</b>		
% Nutrient Tolerant individuals	61	6
<b>WMB-I Assessment Score</b>	<b>---</b>	<b>6</b>
<b>WMB-I Assessment Rating</b>		<b>Very Poor(0-14)</b>

## 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.

Median 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, chloride, water temperature and chlorophyll-a 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 *very poor* condition. Overall habitat quality was categorized as *sub-optimal*. Results from water quality sampling showed conductivity and nutrient concentrations to be higher than expected based on the 90th percentile of data collected at least impaired reference reaches in the Southern Pine Plains & Hills ecoregion.

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**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
<b>Physical</b>								
Temperature (°C)	14	8.8	27.5	25.7 <sup>M</sup>	23.9	4.7		
Turbidity (NTU)	19	1.8	7.9	2.8	3.3	1.6		
Total Dissolved Solids (mg/L)	8	27.0	290.0	189.5 <sup>M</sup>	168.8	93.6		
Total Suspended Solids (mg/L)	8	<1.0	6.0	1.2	1.8	1.9		
Specific Conductance (µmhos)	14	92.9	449.7	305.7 <sup>G</sup>	308.8	86.1		
Hardness (mg/L)	8	29.3	97.2	71.8 <sup>G</sup>	67.0	24.7		
<sup>J</sup> Alkalinity (mg/L)	8	24.7	68.4	47.2 <sup>M</sup>	44.2	14.9		
Stream Flow (cfs)	14	0.7	5.7	3.2	3.2	1.4		
<b>Chemical</b>								
Dissolved Oxygen (mg/L)	13	5.9	7.3	7.0	6.9	0.4		
pH (su)	14	6.3	7.0	6.8	6.7	0.2		
Ammonia Nitrogen (mg/L)	8	<0.006	0.363	0.005	0.060	0.125		
Nitrate+Nitrite Nitrogen (mg/L)	8	0.305	15.700	7.330 <sup>M</sup>	7.517	5.105		
Total Kjeldahl Nitrogen (mg/L)	8	0.494	1.070	0.633 <sup>M</sup>	0.700	0.216		
Total Nitrogen (mg/L)	8	1.288	16.414	8.149 <sup>M</sup>	8.217	5.072		
Dissolved Reactive Phosphorus (mg/L)	8	0.038	1.310	0.627 <sup>M</sup>	0.617	0.395		
Total Phosphorus (mg/L)	8	0.146	1.420	0.663 <sup>M</sup>	0.675	0.386		
CBOD-5 (mg/L)	8	<2.0	<2.0	1.0	1.0	0.0		
Chlorides (mg/L)	8	9.5	44.8	27.3 <sup>M</sup>	25.7	12.2		
<b>Total Metals</b>								
<sup>J</sup> Aluminum (mg/L)	6	<0.050	0.253	0.088	0.105	0.077		
Iron (mg/L)	6	0.228	0.878	0.364	0.492	0.299		
<sup>J</sup> Manganese (mg/L)	6	<0.006	0.080	0.020	0.031	0.028		
<b>Dissolved Metals</b>								
<sup>J</sup> Aluminum (mg/L)	6	<0.050	0.051	0.025	0.034	0.013		
<sup>J</sup> Antimony (µg/L)	8	0.2	7.1 <sup>H</sup>	0.8	1.7	2.3	1	
<sup>J</sup> Arsenic (µg/L)	8	0.4	0.7 <sup>H</sup>	0.5	0.5	0.1		8
Cadmium (µg/L)	8	<0.246	<0.390	0.156	0.152	0.023		
<sup>J</sup> Chromium (µg/L)	8	<0.311	1.100	0.514	0.580	0.305		
<sup>J</sup> Copper (mg/L)	8	<0.0002	0.006	0.004	0.003	0.002		
<sup>J</sup> Iron (mg/L)	6	0.089	0.368	0.226	0.241	0.108		
<sup>J</sup> Lead (µg/L)	8	<0.2	0.5	0.2	0.3	0.1		
<sup>J</sup> Manganese (mg/L)	6	<0.006	0.063	0.018	0.026	0.022		
<sup>J</sup> Nickel (mg/L)	8	0.001	0.013	0.002	0.003	0.004		
Selenium (µg/L)	8	<0.4	<0.5	0.2	0.2	0.0		
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		
Zinc (mg/L)	8	0.009	0.023	0.016	0.016	0.005		
<b>Biological</b>								
Chlorophyll a (ug/L)	8	0.53	10.68	2.28 <sup>M</sup>	3.49	3.34		
E. coli (col/100mL)	14	40	308	63	88	71		

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.