

# 2005 Monitoring Summary



§303(d)/TMDL Monitoring Site

**Boggy Branch** of Brushy Creek (Escambia County) approximately 150 ft. downstream of Atmore WWTP (31.01587/-87.51650)

## BACKGROUND

Boggy Branch, as well as Brushy Creek to which it flows, is on Alabama's 2008 Clean Water Act (CWA) §303(d) list of impaired waters. Boggy Branch from the Atmore Waste Water Treatment Plant (WWTP) downstream to its confluence with Brushy Creek is listed for impairments caused by pathogens and metals (Pb, Cu) from municipal and industrial sources. The segment of Boggy Branch from the Atmore WWTP upstream to Masland Carpets WWTP is listed for impairments caused by Organic Enrichment/Dissolved Oxygen (OE/DO), metals (Zn), and chlorine from industrial sources and ammonia from industrial and municipal sources. (ADEM 2008).



**Fig. 1.** Boggy Br. at BOB-3

The Alabama Department of Environmental Management (ADEM) monitored four locations on Boggy Branch to verify and document causes and sources of impairment in Boggy Branch from Cinderbrand Rd. upstream of the Atmore and Masland Waste Water Treatment Plants downstream to Deere Creek Rd.. Macroinvertebrate and habitat assessments were conducted in Boggy Branch at BOB-3, approximately 150 ft. downstream of the Atmore WWTP to verify impairment to aquatic communities. The assessments were conducted on May 24, 2005.

## RESULTS

Benthic macroinvertebrate communities were sampled using ADEM's Multi-habitat Bioassessment EPT methodology (MB-EPT). The method uses the number of families in three pollution-sensitive aquatic insect orders as an indicator of biological conditions. The results were compared to existing assessment thresholds for the Southern Pine Plains and Hills ecoregion where Boggy Branch is located to evaluate the community's health. Only one EPT family was collected from Boggy Branch at BOB-3, indicating the community to be in *poor* condition (Table 1). The overall habitat assessment score (146) was in the *sub-optimal* category. In-stream habitat quality was *marginal* due to low velocity and a lack of stable substrates (Table 2). Sewage odors were noticed in both the water and sediments. The Atmore WWTP was discharging gray water at the time of the assessment. Water color was gray. Organic sludge was greater than 5 inches deep in portions of the stream reach.

**Table 1.** Habitat and MB-EPT assessment results

<b>MB-EPT Assessment</b>	
# EPT Families	1
<b>MB-EPT Site Rating</b>	<b>Poor</b>
<b>Habitat Assessment (% maximum)</b>	
Instream habitat quality	49
Sediment deposition	70
Sinuosity	38
Bank and vegetative stability	70
Riparian buffer	90
Habitat Assessment Score	146
% Maximum	66
<b>Habitat Assessment Rating</b>	<b>Sub-optimal</b>

Results of monthly water quality data collected March-October 2005 are presented in Table 3. Mean fecal coliform was 3226 colonies/100 mL; individual fecal coliform samples were above the 2000 colonies/100 mL criteria for Fish & Wildlife Use Classification during six of seven monthly samples, with 9,000 colonies/100 mL measured during August 23, 2005.

Monthly water samples were analyzed for total and dissolved metals concentrations (Table 3). Results were compared to ADEM's established chronic aquatic life use criteria for dissolved Cadmium, Copper, Chromium, Lead, Nickel, Silver, and Zinc. Dissolved copper concentrations were below detection limit

during all sampling events (<0.005mg/L during Mar-Aug; <0.1mg/L in Sep; and <0.01mg/L in October). When adjusted for hardness concentrations, the dissolved zinc concentration was above chronic aquatic life use criteria during May and dissolved lead concentration was above chronic aquatic life use criteria during March and April. Median nutrient concentrations were much higher than values expected in this ecoregion.

**Table 2.** Summary of physical characteristics observed May 24, 2005.

Physical Characteristics	
Ecoregion <sup>a</sup>	65f
Width (ft)	7
Canopy cover	Shaded
Depth (ft)	
	Run 1.5
	Pool 2.0
% of Reach	
	Run 20
	Pool 80
% Substrate	
	Gravel 2
	Sand 30
	Detritus 20
	Clay 10
	Organic Silt 38

a. Southern Pine Plains and Hills

## CONCLUSIONS

In situ measurements and water samples were collected monthly during March through October of 2005 to help identify any stressors to the biological communities. Results of monthly water quality sampling (Table 3) verified impairment from metals and pathogens. Dissolved zinc and lead concentrations exceeded chronic aquatic life use criteria during May and March and April, respectively. Individual fecal coliform samples were above the 2000 colonies/100 mL criteria for Fish & Wildlife Use Classification during 6 of the 7 monthly samples. Nutrient concentrations were also well above values expected in this ecoregion. Results of the EPT screening-level assessment suggested that water quality and habitat conditions are negatively impacting biological communities in the stream reach.

**Table 3.** Summary of water quality data collected March-October, 2005. 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. Metals results were compared to ADEM's chronic aquatic life use criteria adjusted for hardness.

Parameter	N	Min	Max	Median	Avg	SD
<b>Physical</b>						
Temperature (°C)	8	19.9	29.1	25.6	24.7	3.9
Turbidity (NTU)	8	4.6	72.8	14.4	25.5	24.9
Total dissolved solids (mg/L)	8	272.0	376.0	344.0 <sup>M</sup>	339.5	32.5
Total suspended solids (mg/L)	8	10.0	52.0	15.0 <sup>M</sup>	19.3	13.6
Specific conductance (µmhos)	8	512.0	984.0	575.0 <sup>M</sup>	623.1	150.7
Hardness (mg/L)	8	33.0	106.0	52.5 <sup>M</sup>	58.0	23.4
Alkalinity (mg/L)	8	50.0	141.0	76.5 <sup>M</sup>	86.0	30.1
Stream Flow (cfs)	8	3.2	7.524	3.9	4.3	1.3
<b>Chemical</b>						
Dissolved oxygen (mg/L)	8	5.3	7.06	6.4	6.2	0.6
pH (su)	8	6.4	7.08	6.8	6.8	0.2
Ammonia Nitrogen (mg/L)	8	1.800	22.000	5.200 <sup>M</sup>	8.337	7.075
Nitrate+Nitrite Nitrogen (mg/L)	8	0.183	11.300	8.740 <sup>M</sup>	7.940	3.662
Total Nitrogen (mg/L)	8	11.990	32.183	17.850 <sup>M</sup>	20.928	7.599
Total Kjeldahl Nitrogen (mg/L)	8	4.200	32.000	7.300 <sup>M</sup>	12.988	10.611
Dissolved reactive phosphorus (mg/L)	8	0.579	1.980	1.120 <sup>M</sup>	1.217	0.508
Total phosphorus (mg/L)	8	0.888	2.850	1.610 <sup>M</sup>	1.730	0.650
CBOD-5 (mg/L)	8	1.9	> 7.2	> 4.0 <sup>M</sup>	> 4.7	2.1
Chlorides (mg/L)	8	32.0	61.0	45.5	46.6	8.3
<b>Total Metals</b>						
Aluminum (mg/L)	8	0.27	1.45	0.40	0.62	0.48
Iron (mg/L)	8	0.7	3.0	1.4	1.6	0.8
Manganese (mg/L)	8	0.062	0.134	0.076	0.086	0.023
<b>Dissolved Metals</b>						
Aluminum (mg/L)	8	0.13	0.38	0.23	0.24	0.09
Antimony (µg/L)	8	< 7.5	47.0	9.2	18.5	15.2
Cadmium (mg/L)	8	< 0.001	0.010	0.003	0.004	0.005
Chromium (mg/L)	8	< 0.005	0.010	0.005	0.006	0.002
Copper (mg/L)	8	< 0.002	< 0.050	0.002	0.009	0.017
Iron (mg/L)	8	0.26	0.82	0.47	0.50	0.17
<sup>A</sup> Lead (µg/L)	8	2.8	< 20.0	4.0	5.7	3.6
Manganese (mg/L)	8	0.006	0.106	0.064	0.056	0.033
Mercury (µg/L)	8	< 0.5	0.8	0.2	0.3	0.2
Nickel (mg/L)	8	< 0.005	0.023	0.002	0.010	0.010
Selenium (µg/L)	8	< 7.5	< 30	6.9	8.8	5.6
Silver (mg/L)	8	< 0.001	< 0.05	0.003	0.010	0.012
Thallium (µg/L)	8	< 9.0	< 10.0	4.5	4.7	0.3
<sup>A</sup> Zinc (mg/L)	8	0.034	0.064	0.045	0.045	0.010
<b>Biological</b>						
Fecal Coliform (col/100 mL)	8	110	> 9000 <sup>c</sup>	> 3000	> 3226	2616

N=# samples; A=exceeds established chronic aquatic life use criteria (see text); C=value exceeds established criteria for Fish&Wildlife water use classification; M=value >90% of ADEM's verified reference

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