

# 2015 Monitoring Summary



## Affonee Creek at Big Barn Road in Bibb County (33.92260/-87.24887)

### BACKGROUND

Affonee Creek is one of the streams the Alabama Department of Environmental Management (ADEM) monitors as a potential “best attainable condition” reference watershed for comparison with streams throughout the Fall Line Hills ecoregion.

Affonee Creek was selected for biological and water quality monitoring as part of the 2015 Surface Water Quality Plan. The objectives were to assess the biological integrity and to estimate overall water quality. Habitat and macroinvertebrate assessments were conducted on Affonee Creek at AFFB-3 on May 20, 2015.



Figure 1. Affonee Creek at AFFB-3 on May 20, 2015..

### WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Affonee Creek at AFFB-3 is a *Fish & Wildlife (F&W)* stream located near Brent, in Bibb County. According to the 2011 National Land Cover Dataset, land use within the watershed is primarily forest (81%) with some shrub/scrub. As of April 1, 2016, two NPDES permits were 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. Affonee Creek at AFFB-3 is a run stream located in the Fall Line Hills ecoregion (Figure 1). Bottom substrate consists primarily of sand. Overall habitat quality was rated as *sub-optimal* for supporting a diverse aquatic macroinvertebrate community.

### BIOASSESSMENT RESULTS

The benthic macroinvertebrate community was 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 the individual metric scores. The metric results indicated the macroinvertebrate community to be in *good* condition (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
<b>Basin</b>		Cahaba R
<b>Drainage Area (mi<sup>2</sup>)</b>		30
<b>Ecoregion<sup>a</sup></b>		651
<b>Landuse<sup>b</sup></b>		
	Open water	<1%
	Wetland	
	Woody	4%
	Emergent herbaceous	<1%
	Forest	
	Deciduous	29%
	Evergreen	27%
	Mixed	25%
	Shrub/scrub	7%
	Grassland/herbaceous	2%
	Pasture/hay	3%
	Development	
	Open space	2%
	Low intensity	<1%
	Moderate intensity	<1%
	Barren	<1%
<b>Population/km<sup>2c</sup></b>		5
<b># NPDES Permits<sup>d</sup></b>	<b>TOTAL</b>	2
	Construction	2

a. Fall Line 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 Affonee Creek at AFFB-3, May 20, 2015.

Physical Characteristics	
<b>Width (ft)</b>	18
<b>Canopy Cover</b>	Mostly Shaded
<b>Depth (ft)</b>	
Run	0.5
Pool	3.0
<b>% of Reach</b>	
Run	70
Pool	30
<b>% Substrate</b>	
Mud/Muck	2
Sand	76
Silt	2
Organic Matter	20

**Table 3.** Results of the habitat assessment conducted on Affonee Creek at AFFB-3, May 20, 2015.

Habitat Assessment	% Maximum Score	Rating
Instream Habitat Quality	54	Marginal (31-57)
Sediment Deposition	68	Sub-optimal (55-79)
Sinuosity	50	Marginal (31-57)
Bank Vegetative Stability	49	Marginal (31-57)
Riparian Buffer	83	Sub-optimal (55-79)
<b>Habitat Assessment Score</b>	<b>109</b>	
<b>% Maximum Score</b>	<b>60</b>	<b>Sub-optimal (55-79)</b>

**Table 4.** Results of the macroinvertebrate bioassessment conducted on Affonee Creek at AFFB-3, May 20, 2015.

Macroinvertebrate Assessment	Results	Scores
<b>Taxonomic richness &amp; diversity metrics</b>		
# EPT Taxa	<b>16</b>	<b>64</b>
<b>Taxonomic composition metrics</b>		
% Plecoptera	<b>8</b>	<b>38</b>
% Dominant Taxon	<b>27</b>	<b>57</b>
% Non-Insect Taxa	<b>6</b>	<b>97</b>
<b>Functional composition metrics</b>		
% Predators	<b>20</b>	<b>69</b>
<b>Tolerance metrics</b>		
Becks Community Tolerance Index	<b>13</b>	<b>59</b>
% Nutrient Tolerant Individuals	<b>34</b>	<b>61</b>
<b>WMB-I Assessment Score</b>	<b>---</b>	<b>64</b>
<b>WMB-I Assessment Rating</b>		<b>Good (55.5-78.4)</b>

## WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. In situ measurements and water samples were collected March through October of 2015 to help identify any stressors to the biological community. For Affonee Creek at AFFB-3, the *F&W* water quality criterion for pH was violated in September. Also, samples for pH, hardness and dissolved iron were higher than values expected based on data collected at reference reaches within in the Fall Line Hills ecoregion (65i). Dissolved copper exceeded criteria during the August sampling visit; however, this is within expected range based on reference reaches within the Fall Line Hills ecoregion. *E. coli* exceeded the maximum criteria for a single sample during the July, August and September station visits. Monitoring should continue to ensure that conditions remain stable within the reach.

## SUMMARY

Bioassessment results indicated the macroinvertebrate community in Affonee Creek at AFFB-3 to be in *good* condition. Overall habitat quality was categorized as *sub-optimal* for supporting the biological community. Results of water chemistry analyses showed that *E. coli* exceeded the maximum criteria for a single sample during three months of the sampling period. Dissolved copper had a criteria exceedance though it is within the expected range for that ecoregion. Samples for pH and hardness were higher than values expected based on data collected at reference reaches within in the Fall Line Hills ecoregion (65i).

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**Table 5.** Summary of water quality data collected March-October, 2015. Minimum (Min) and maximum (Max) values calculated using minimum detection limits (MDL). Median (Med), 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)	9	17.0	26.7	23.0	22.1	3.3		
Turbidity (NTU)	9	12.4	26.4	21.2	20.8	4.3		
J Total Dissolved Solids (mg/L)	8	33.0	59.0	37.0	41.1	9.0		
Total Suspended Solids (mg/L)	8	3.0	17.0	12.0	11.8	4.5		
Specific Conductance (µmhos/cm)	9	19.0	33.0	25.0	24.6	4.9		
J Hardness (mg/L)	4	1.9	9.8	7.2 <sup>G</sup>	6.6	3.5		
J Alkalinity (mg/L)	8	< 1.0	6.0	4.3	3.7	2.0		
Monthly Stream Flow (cfs)	9	3.8	37.1	7.8	13.3	11.9		
Measured Stream Flow (cfs)	9	3.8	37.1	7.8	13.3	11.9		
<b>Chemical</b>								
Dissolved Oxygen (mg/L)	9	7.4	9.4	8.1	8.3	0.7		
pH (SU)	9	6.5	8.9 <sup>C</sup>	7.5 <sup>M</sup>	7.4	0.8	1	
J Ammonia Nitrogen (mg/L)	8	< 0.007	0.146	0.025	0.039	0.048		
Nitrate+Nitrite Nitrogen (mg/L)	8	0.036	0.156	0.078	0.088	0.042		
J Total Kjeldahl Nitrogen (mg/L)	8	0.147	1.190	0.496	0.542	0.331		
J Total Nitrogen (mg/L)	8	0.253	1.226	0.574	0.630	0.300		
J Dis Reactive Phosphorus (mg/L)	8	< 0.005	0.007	0.004	0.004	0.000		
Total Phosphorus (mg/L)	8	0.012	0.068	0.018	0.026	0.019		
J CBOD-5 (mg/L)	8	< 2.0	< 2.0	1.0	1.0	0.0		
COD (mg/L)	8	3.8	19.0	13.9	13.0	4.6		
J TOC (mg/L)	8	3.3	6.0	4.4	4.6	0.9		
J Chlorides (mg/L)	8	0.9	2.5	2.3	2.0	0.5		
<b>Total Metals</b>								
J Aluminum (mg/L)	4	0.075	0.324	0.227	0.213	0.125		
J Iron (mg/L)	4	2.040	4.250	3.180	3.162	0.903		
Manganese (mg/L)	4	0.091	0.225	0.156	0.157	0.059		
<b>Dissolved Metals</b>								
J Aluminum (mg/L)	4	0.023	0.045	0.031	0.032	0.011		
J Antimony (µg/L)	4	< 0.2	< 0.2	0.1	0.1	0.0		
J Arsenic (µg/L)	4	< 0.1	0.3 <sup>A</sup>	0.2	0.2	0.1	3	
J Cadmium (µg/L)	4	< 0.118	< 0.118	0.059	0.059	0.000		
J Chromium (µg/L)	4	< 0.131	0.659	0.215	0.289	0.257		
J Copper (µg/L)	4	< 0.180	23.600 <sup>S</sup>	0.278	6.062	11.693	1	
Iron (mg/L)	4	0.748	1.490	1.100 <sup>M</sup>	1.110	0.305		
Lead (µg/L)	4	< 0.2	< 0.2	0.1	0.1	0.0		
Manganese (mg/L)	4	0.106	0.216	0.124	0.143	0.051		
J Nickel (µg/L)	4	< 0.232	0.975	0.270	0.408	0.405		
J Selenium (µg/L)	4	< 0.341	< 0.341	0.170	0.170	0.000		
J Silver (µg/L)	4	< 0.208	< 0.208	0.104	0.104	0.000		
Thallium (µg/L)	4	< 0.2	< 0.2	0.1	0.1	0.0		
J Zinc (µg/L)	4	< 0.857	4.470 <sup>S</sup>	0.429	1.776	2.333	1	
<b>Biological</b>								
Chlorophyll a (mg/m <sup>3</sup> )	8	< 1.00	< 1.00	0.50	0.50	0.00		
<i>E. coli</i> (MPN/DL)	8	155.3	> 2419.6 <sup>H</sup>	550.8	731.6	705.4	3	

A=*F&W* aquatic life use criterion exceeded; 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 65i; H=*F&W* human health criterion exceeded; J=estimate; M=value >90% of all verified ecoregional reference reach data collected in the ecoregion 65i; N=# samples; Q=# of uncertain exceedances; S=*F&W* hardness-adjusted aquatic life use criteria exceeded;