

# 2009 Monitoring Summary



Butler Creek in Lauderdale County at Co. Rd 302 (34.97375/-87.61126)

## BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Butler Creek watershed for biological and water quality monitoring as part of the 2009 Tennessee (TN) River Basin Monitoring. The objectives of the project were to assess the biological integrity of each monitoring site and to estimate overall water quality within the Tennessee basin. Habitat and macroinvertebrate assessments were conducted on Butler Creek at BTLL-1 on July 1, 2009.

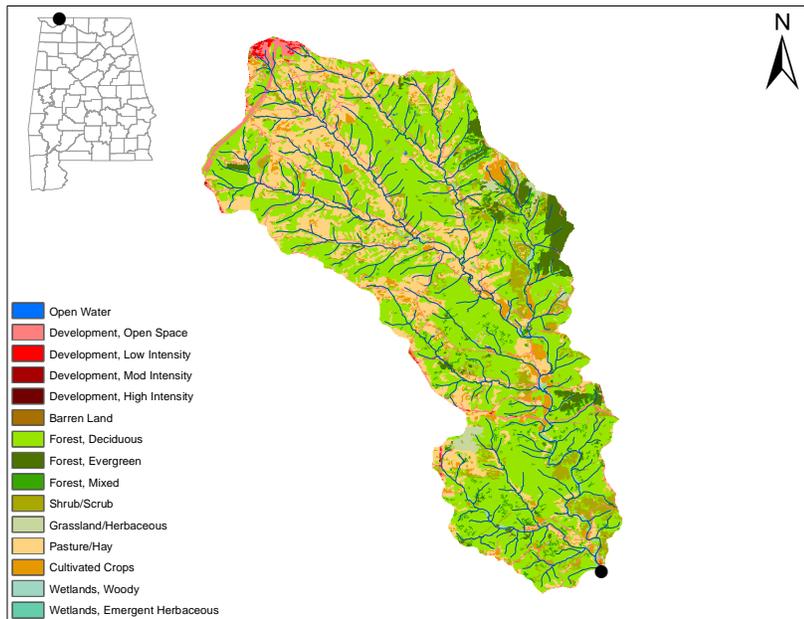


Figure 1. Sampling location and landuse within the Butler Creek watershed at BTLL-1.

## WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Butler Creek is a large *Fish & Wildlife (F&W)* stream located in Lauderdale County. Based on the 2006 National Land Cover Dataset, landuse within the watershed is primarily deciduous forest with some pasture (Figure 1). Population in the area is low. As of September 1, 2012, ADEM's NPDES Management System database shows one permitted discharge within 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.

Butler Creek at BTLL-1 is a riffle-run stream with a bottom substrate dominated by cobble and gravel. Habitat quality and availability was rated as *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. Metric results indicated the macroinvertebrate community to be in *fair* community condition (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		Tennessee R
Basin		Tennessee R
Drainage Area (mi <sup>2</sup> )		60
Ecoregion <sup>a</sup>		71f
% Landuse		
Open water		<1
Wetland	Woody	1
Forest	Deciduous	53
	Evergreen	3
	Mixed	2
Shrub/scrub		7
Grassland/herbaceous		2
Pasture/hay		23
Cultivated crops		4
Development	Open space	4
	Low intensity	<1
	Moderate intensity	<1
	High intensity	<1
Barren		53
Population/km <sup>2b</sup>		17
# NPDES Permits <sup>c</sup>	<b>TOTAL</b>	1
	Construction Stormwater	1

a. Western Highland Rim

b. 2000 US Census

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

Table 2. Physical characteristics of Butler Creek at BTLL-1, July 1, 2009.

Physical Characteristics		
Width (ft)		60
Canopy Cover		Open
Depth (ft)		
	Riffle	0.2
	Run	1.0
	Pool	1.5
% of Reach		
	Riffle	5
	Run	80
	Pool	15
% Substrate		
	Bedrock	15
	Cobble	35
	Gravel	35
	Sand	5
	Silt	8
	Organic Matter	2

**Table 3.** Results of the habitat assessment conducted on Butler Creek at BTLL-1, July 1, 2009.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	68	Sub-optimal (59-70)
Sediment Deposition	72	Optimal >70
Sinuosity	63	Marginal (45-64)
Bank and Vegetative Stability	75	Optimal >74
Riparian Buffer	74	Sub-optimal (70-89)
<b>Habitat Assessment Score</b>	<b>170</b>	
<b>% Maximum Score</b>	<b>71</b>	<b>Optimal &gt;70</b>

**Table 4.** Results of the macroinvertebrate bioassessment conducted in Butler Creek at BTLL-1, July 1, 2009.

Macroinvertebrate Assessment		
	Results	Scores (0-100)
<b>Taxa richness and diversity measures</b>		
# EPT taxa	16	52
Shannon Diversity	4.25	72
<b>Taxonomic composition measures</b>		
% EPT minus Baetidae and Hydropsychidae	13	26
% Non-insect taxa	24	0
<b>Functional feeding group</b>		
% Predator Individuals	6	18
<b>Community tolerance</b>		
% Tolerant taxa	32	49
<b>WMB-I Assessment Score</b>	---	<b>36</b>
<b>WMB-I Assessment Rating</b>		<b>Fair (29-43)</b>

## WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. In situ measurements and water samples were collected monthly, semi-monthly (metals), or quarterly (pesticides, atrazine, and semi-volatile organics) during March through October of 2009 to help identify any stressors to the biological communities. Organics were collected at BTLL-1 on March 18th and July 22nd, but all parameters were below detection limits. The median dissolved reactive phosphorus concentration was higher than expected based on reference data collected in the Western Highland Rim ecoregion.

## SUMMARY

Results from the 2009 bioassessment indicated the macroinvertebrate community in Butler Creek at BTLL-1 to be in *fair* condition. Habitat quality and availability was rated as *optimal* for supporting diverse aquatic macroinvertebrate communities. Median dissolved reactive phosphorus was higher than expected based on reference data collected in the Western Highland Rim ecoregion. Monitoring should continue to ensure that water quality and biological conditions remain stable.

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**Table 5.** Summary of water quality data collected March-October, 2009. Minimum (Min) and maximum (Max) values calculated using minimum detection limits (MDL). 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
<b>Physical</b>						
Temperature (°C)	9	10.3	26.8	24.1	20.5	6.5
Turbidity (NTU)	9	2.0	5.4	3.4	3.4	1.1
Total Dissolved Solids (mg/L)	8	18.0	45.0	39.0	36.5	8.2
Total Suspended Solids (mg/L)	8	1.0	6.0	3.0	3.2	1.8
Specific Conductance (µmhos)	9	39.0	70.0	62.0	60.5	9.9
Hardness (mg/L)	3	21.5	28.6	27.2	25.8	3.8
Alkalinity (mg/L)	8	16.0	33.5	23.8	25.0	6.0
Stream Flow (cfs)	8	23.2	258.3	70.0	105.6	88.4
<b>Chemical</b>						
Dissolved Oxygen (mg/L)	9	7.7	11.5	8.7	9.2	1.3
pH (su)	9	7.1	7.8	7.4	7.4	0.2
<sup>B</sup> Ammonia Nitrogen (mg/L)	2	< 0.006	< 0.006	0.003	0.003	0.000
<sup>B</sup> Nitrate+Nitrite Nitrogen (mg/L)	5	< 0.003	1.843	0.246	0.492	0.772
<sup>B</sup> Total Kjeldahl Nitrogen (mg/L)	2	< 0.089	< 0.089	0.044	0.044	0.000
<sup>B</sup> Total Nitrogen (mg/L)	2	< 0.290	< 0.410	0.350	0.350	0.085
<sup>J</sup> Dissolved Reactive Phosphorus (mg/L)	8	0.024	0.101	0.075 <sup>M</sup>	0.075	0.027
<sup>B</sup> Total Phosphorus (mg/L)	2	0.049	0.066	0.058	0.058	0.012
CBOD-5 (mg/L)	8	< 1.0	< 1.0	0.5	0.5	0.0
Chlorides (mg/L)	8	0.7	96.9	1.2	13.1	33.9
Atrazine (µg/L)	2	< 0.06	< 0.06	0.03	0.03	0.00
<b>Total Metals</b>						
<sup>J</sup> Aluminum (mg/L)	4	< 0.060	0.077	0.030	0.042	0.024
<sup>J</sup> Iron (mg/L)	4	0.056	0.106	0.064	0.072	0.023
<sup>J</sup> Manganese (mg/L)	4	< 0.009	0.018	0.015	0.013	0.006
<b>Dissolved Metals</b>						
<sup>J</sup> Aluminum (mg/L)	4	0.035	< 0.060	0.030	0.031	0.002
Antimony (µg/L)	4	< 6.0	< 6.0	3.0	3.0	0.0
Arsenic (µg/L)	4	< 0.4	< 0.4	0.2	0.2	0.0
Cadmium (mg/L)	4	< 0.000	< 0.002	0.001	0.001	0.000
<sup>J</sup> Chromium (mg/L)	4	< 0.007	0.013	0.004	0.006	0.005
Copper (mg/L)	4	< 0.200	< 0.200	0.100	0.100	0.000
<sup>J</sup> Iron (mg/L)	4	< 0.020	0.191	0.020	0.060	0.088
<sup>J</sup> Lead (µg/L)	4	0.4	< 1.5	0.8	0.7	0.2
<sup>J</sup> Manganese (mg/L)	4	< 0.009	0.011	0.008	0.008	0.004
Nickel (mg/L)	4	< 0.008	< 0.008	0.004	0.004	0.000
Selenium (µg/L)	4	< 0.4	< 0.4	0.2	0.2	0.0
Silver (mg/L)	4	< 0.001	< 0.001	0.000	0.000	0.000
Thallium (µg/L)	4	< 0.4	< 0.4	0.2	0.2	0.0
Zinc (mg/L)	4	< 0.060	< 0.060	0.030	0.030	0.000
<b>Biological</b>						
Chlorophyll a (ug/L)	8	< 1.00	< 1.00	0.50	0.50	0.00
<sup>J</sup> Fecal Coliform (col/100 mL)	8	2	100	38	37	31
<sup>J</sup> E. coli (col/100mL)	2	59	140	99	99	58

B=samples excluded due to laboratory QC concerns; J=estimate; M=value >90% of all verified ecoregional reference reach data collected in the ecoregion 71f; N=# samples.