

# 2016 Monitoring Summary



## Butler Creek at Lauderdale County Road 302 (34.97375/-87.61126)

### BACKGROUND

Butler Creek is among the least-disturbed watersheds within the Western Highland Rim ecoregion, based on landuse, road density, and population density. Data from reference watersheds are used to characterize natural or background conditions expected in different ecoregions throughout the state. Butler Creek was sampled in 2016 to provide high-quality reference reach data for streams located in the Interior Plateau ecoregion. Habitat and fish community surveys were conducted to assess the health of the biological communities.

In addition, Butler Creek is a tributary of Shoal Creek, which has been classified as one of 50 Strategic Habitat Units (SHU) by the U.S. Fish and Wildlife Service (USFWS) and the Alabama Rivers & Streams Network (ARSN). SHUs are recognized as high-quality habitats occupied by federally listed and state imperiled species.



Figure 1. Pool habitat in Butler Creek at BTLL-1, May 1, 2019.

Table 1. Summary of general watershed characteristics: BTLL-1 (2016)

Watershed Characteristics	
Basin	Tennessee
Drainage Area (mi <sup>2</sup> )	60.2
Ecoregion <sup>o</sup>	71F
Assessment Unit	AL06030005-0507-100
Use Class	F&W
AU Category	1
12-digit Hydrologic Unit Code (HUC)	060300050507
Conservation Status	
Strategic Habitat Unit †	4 Shoal Creek (0603)
Landuse Categories (2011 National Land Cover Dataset)	
Wetland, Total (%)	1.1
Wetlands, Woody (%)	1.1
Forested, Total (%)	55.9
Forested, Deciduous (%)	49.7
Forested, Evergreen (%)	4.1
Forested, Mixed (%)	2.1
Shrub/Scrub (%)	9.6
Grassland/Herbaceous (%)	2.7
Pasture/Hay (%)	22.0
Crops, Cultivated (%)	3.0
Developed, Total (%)	5.7
Developed, Open Space (%)	4.8
Developed, Low Intensity (%)	0.7
Developed, Medium Intensity (%)	0.2
Population/km <sup>2</sup> (2010 US Census)	14
Roads	
Road Density	1.4

<sup>o</sup> Western Highland Rim

† 12-digit HUC located in a Strategic Habitat Unit.

### WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Although classified as a F&W stream, Butler Creek is known for its ecological significance and is one of the most biologically diverse streams per watershed area in Alabama. It is a tributary of Shoal Creek, which has been classified as a SHU based on its geomorphically stable channel and natural flow regime to support the behavior, growth, and survival of several aquatic species listed as threatened or endangered by the USFWS, and of *Highest or High Conservation Concern* by the ADCNR. The Butler Creek watershed is approximately 55% forested, with some pasture/hay land cover. There are no permitted outfalls, and relatively few road crossings.

### REACH CHARACTERISTICS

General observations (Figure 1, Table 2) and a habitat survey (Table 3) were completed during the Index of Biotic Integrity (AL-IBI) fish community survey. 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. Like other streams in ecoregion 71F, Butler Creek at BTLL-1 is characterized by gravel, cobble and bedrock substrates. The 900 ft stream reach is wide, with a mostly-open canopy, and long riffle/run complexes separating shallow pools. Overall habitat quality and availability was rated as *optimal* for supporting fish and other aquatic communities.

Table 2. Physical characteristics of Butler Creek at BTLL-1, May 3, 2016.

Physical Characteristics	
Width (ft)	87
Canopy Cover	Mostly Open
Depth (ft)	
Riffle	0.5
Run	1.0
Pool	2.5
% of Reach	
Riffle	10
Run	40
Pool	50
% Substrate	
Bedrock	20
Boulder	2
Cobble	21
Gravel	40
Hard Pan Clay	3
Sand	5
Silt	10
Organic Matter	4

**Table 3.** Results of the habitat assessment survey conducted on Butler Creek at BTLL-1, May 3, 2016.

Habitat Survey	% Max Score	Rating
Instream Habitat Quality	85	Optimal (80-100)
Sediment Deposition	75	Sub-optimal (55-75)
Riffle Frequency	73	Sub-optimal (55-75)
Bank Vegetative Stability	85	Optimal (80-100)
Riparian Zone Measurements	85	Optimal (85-100)
<b>Habitat Assessment Score</b>	<b>164</b>	
<b>% Maximum Score</b>	<b>82</b>	<b>Optimal (81-100)</b>

## BIOASSESSMENT RESULTS

The fish community in Butler Creek at BTLL-1 was sampled using Alabama's Fish Community Index of Biotic Integrity (AL-IBI), developed through a multi-agency (GSA, ADCNR, ADEM) project to establish a comprehensive fish community bioassessment tool for Wadeable Streams and Rivers across the State. The data collected during this survey were used to score the overall health of the fish community, based on conditions expected for Wadeable Streams and Rivers in the Tennessee Valley Ichthyoregion. The condition of the fish community was rated as *excellent*, identifying BTLL-1 as having one of the highest-functioning ecosystems found in Alabama. Taxa richness and diversity are outstanding, with 30 total native species, seven of which are intolerant of degraded water quality and habitat conditions (Table 4).

**Table 4.** Results of the fish assessment conducted on Butler Creek at BTLL-1, May 3, 2016.

Fish Assessment	Results	Scores
<b>Taxonomic richness and diversity metrics</b>		
Total Native Species	30	5
Number of shiner species	6	5
Number of Sucker Species	3	5
Number of darter+madtom species	8	3
<b>Tolerance metrics</b>		
Number of intolerant species	7	5
Percent of tolerant species	12	5
Percent Lepomis	2	5
<b>Trophic metrics</b>		
Percent invertivores	3	5
Percent omnivores	14	5
Percent top carnivores	2	5
<b>Abundance, condition, and reproductive metrics</b>		
Percent DELT+hybrids		5
Number of lithophilic spawners	24	5
<b>IBI Survey Score</b>		<b>58</b>
<b>IBI Survey Rating</b>		<b>Excellent (50-60)</b>

## WATER CHEMISTRY

Results of water chemistry analyses are summarized in Table 5. In situ measurements and water samples were collected monthly and semi-monthly (metals), from March through October 2016, to help characterize water quality conditions within the watershed. The *E. coli* sample collected in August exceeded the F&W criterion; however, this is likely due to heavy rain. Dissolved oxygen concentrations were good, and the water temperature was low. Median sediment, nutrient, and metals concentrations were among the lowest measured throughout the Western Highland Rim sub-ecoregion. All parameters were within the range of expected conditions, based on data collected at reference reaches within the ecoregion.

## SUMMARY

Located in Lauderdale County, Butler Creek at BTLL-1 is located within the Interior Plateau ecoregion. The watershed contains no permitted outfalls, and over half of its watershed is forested. As a tributary located within the Shoal Creek SHU, the watershed maintains a relatively stable channel and natural flow regime, which are necessary to support the behavior, growth, and survival of several federally listed endangered and threatened species, and several species listed to be of the *Highest* or *High Conservation Concern* by the state of Alabama.

Based on the 2016 monitoring conducted by the ADEM, water quality conditions continue to be excellent, exhibiting low water temperatures, and low concentrations of sediment, nutrients, and metals. Fish diversity and taxa richness within the reach are among the highest sampled in the state.

**Table 5.** Summary of water quality data collected March-October, 2016. 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
<b>Physical</b>							
Temperature (°C)	9	15.1	25.9	19.5	20.7	4.4	
Turbidity (NTU)	10	1.5	3.8	2.2	2.3	0.7	
Total Dissolved Solids (mg/L)	8	33.0	52.0	44.5	43.9	6.4	
Total Suspended Solids (mg/L)	8	< 1.0	6.0	3.0	3.2	2.1	
Specific Conductance (µmhos/cm)	9	57.0	72.0	62.0	62.4	5.5	
Hardness (mg/L)	4	22.1	31.9	27.2	27.1	5.1	
Alkalinity (mg/L)	8	9.3	31.3	27.0	23.0	8.4	
Monthly Stream Flow (cfs)	10	14.8	174.8	37.0	53.5	47.6	
Measured Stream Flow (cfs)	10	14.8	174.8	37.0	53.5	47.6	
<b>Chemical</b>							
Dissolved Oxygen (mg/L)	9	7.7	10.8	9.4	9.4	1.0	
pH (SU)	9	7.3	7.9	7.7	7.6	0.2	
<sup>J</sup> Ammonia Nitrogen (mg/L)	8	< 0.018	0.026	0.009	0.011	0.006	
<sup>J</sup> Nitrate+Nitrite Nitrogen (mg/L)	8	< 0.014	0.445	0.168	0.199	0.154	
<sup>J</sup> Total Kjeldahl Nitrogen (mg/L)	8	0.108	0.590	0.268	0.311	0.145	
<sup>J</sup> Dis Reactive Phosphorus (mg/L)	8	0.005	0.010	0.008	0.008	0.001	
<sup>J</sup> Total Phosphorus (mg/L)	8	0.007	0.013	0.012	0.011	0.002	
CBOD-5 (mg/L)	8	< 2.0	< 2.0	1.0	1.0	0.0	
<sup>J</sup> COD (mg/L)	7	< 2.0	10.1	4.0	4.5	2.8	
<sup>J</sup> TOC (mg/L)	8	0.8	1.4	1.0	1.1	0.2	
<sup>J</sup> Chlorides (mg/L)	8	0.9	2.2	1.3	1.5	0.5	
<sup>J</sup> Sulfate (mg/L)	8	1.84	11.10	5.78	6.12	3.94	
<b>Total Metals</b>							
<sup>J</sup> Aluminum (mg/L)	4	< 0.014	0.046	0.014	0.020	0.018	
<sup>J</sup> Iron (mg/L)	4	0.054	0.246	0.066	0.108	0.092	
<sup>J</sup> Manganese (mg/L)	4	0.010	0.023	0.016	0.016	0.005	
<b>Dissolved Metals</b>							
Aluminum (mg/L)	4	< 0.012	< 0.014	0.007	0.007	0.000	
<sup>J</sup> Antimony (µg/L)	4	< 2.920	< 2.920	1.460	1.460	0.000	
Arsenic (µg/L)	4	< 0.699	< 0.699	0.350	0.350	0.000	
Cadmium (µg/L)	4	< 0.839	< 0.839	0.420	0.420	0.000	
Chromium (µg/L)	4	< 1.050	< 1.050	0.525	0.525	0.000	
Copper (µg/L)	4	< 3.620	< 3.620	1.810	1.810	0.000	
<sup>J</sup> Iron (mg/L)	4	0.019	0.038	0.022	0.025	0.009	
Lead (µg/L)	4	< 3.440	< 3.440	1.720	1.720	0.000	
<sup>J</sup> Manganese (mg/L)	4	0.005	0.016	0.010	0.010	0.005	
Nickel (µg/L)	4	< 3.260	< 3.260	1.630	1.630	0.000	
Selenium (µg/L)	4	< 1.440	< 1.440	0.720	0.720	0.000	
Silver (µg/L)	4	< 0.905	< 0.905	0.452	0.452	0.000	
<sup>J</sup> Thallium (µg/L)	4	< 1.080	< 1.080	0.540	0.540	0.000	
<sup>J</sup> Zinc (µg/L)	4	< 10.600	< 10.600	5.300	5.300	0.000	
<b>Biological</b>							
Chlorophyll a (mg/m <sup>3</sup> )	8	< 1.00	5.34	0.50	1.24	1.70	
<i>E. coli</i> (MPN/DL)	8	27.9	307.6 <sup>H</sup>	84.0	97.7	88.2	1

E=# of samples that exceeded criteria; H=F&W human health criterion exceeded; J=estimate; N=# samples.

FOR MONITORING INFORMATION, CONTACT:  
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