

2019 Monitoring Summary



TM

Buxahatchee Creek at power line crossing in Shelby County (33.08583/-86.72083)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) monitored Buxahatchee Creek at BXHS-3a in 2019 to document if TMDL reductions were successful for organic enrichment and nutrients (total phosphorus) and to collect data for the development of a TMDL for pathogen impairment.



Figure 1. Buxahatchee Ck at BXHS-3A, April 30, 2019.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Buxahatchee Creek is a *Fish & Wildlife (F&W)* stream located in the Southern Inner Piedmont ecoregion of Shelby County. Based on the 2011 National Land Cover Dataset, landuse within the watershed is primarily forested (47%), and development (28%). Population density is moderate and road density is low.

REACH CHARACTERISTICS

General observations (Figure 1, Table 2) and a habitat survey (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. Buxahatchee Creek at BXHS-3a (Figure 1) is a high-gradient, bedrock and sand bot-tomed stream. Habitat quality and availability was rated as *sub-optimal* for supporting diverse aquatic macroinvertebrate communities due to sediment deposition and lack of riparian zone stream protection.

BIOASSESSMENT RESULTS

The benthic macroinvertebrate community was sampled using ADEM's Intensive Multi-habitat Bioassessment methodology (WMB-I). Measures of taxonomic richness, community composition and pollution tolerance were used to assess the overall health of the macroinvertebrate community in comparison to conditions expected in north Alabama streams and rivers. Each site is placed in one of six levels ranging from 1, or natural, to 6, or highly altered.

Results of the macroinvertebrate survey on Buxahatchee Creek at BXHS-3a (Table 4) indicate the community to be in *poor-fair* condition, with 41 total taxa and 8 EPT taxa collected. No stoneflies were collected at the site. Twenty-four percent of total taxa are classified as pollution tolerant. The number and percentage of sensitive taxa is lower than expected for Piedmont streams. However, these results indicate distinct improvements in biological conditions since sampling conducted in 2013.

TM Graphics provided by Florida Dept. of Environmental Protection (FDEP); used with permission

Table 1. Summary of general watershed characteristics: BXHS-3A

Watershed Characteristics	
Basin	Coosa
Drainage Area (mi²)	16.1
Ecoregion^o	45a
Assessment Unit	AL03150107-0405-100
Use Class	F&W
AU Category	5
12-digit Hydrologic Unit Code (HUC)	031501070405
Landuse Categories (2011 National Land Cover Dataset)	
Open Water (%)	0.3
Wetland, Total (%)	1.6
Wetlands, Woody (%)	1.6
Forested, Total (%)	46.7
Forested, Deciduous (%)	27.9
Forested, Evergreen (%)	13.7
Forested, Mixed (%)	5.1
Shrub/Scrub (%)	7.1
Grassland/Herbaceous (%)	4.2
Pasture/Hay (%)	9.0
Crops, Cultivated (%)	1.7
Developed, Total (%)	28.2
Developed, Open Space (%)	12.6
Developed, Low Intensity (%)	10.3
Developed, Medium Intensity (%)	4.4
Developed, High Intensity (%)	0.9
Barren Land (Rock, Sand, Clay) (%)	1.3
Population/km (2010 US Census)	144
Roads	
Road Density	3.9
# Road Crossings per Stream km	1.2
Watershed Disturbance Score*	448
Watershed Disturbance Category*	6

^o Southern Inner Piedmont

* Measure of watershed disturbance based on landuse, population, and road density summarized in this table.

Table 2. Physical characteristics of Buxahatchee Creek at BXHS-3A, April 30, 2019.

Physical Characteristics	
Width (ft)	30
Canopy Cover	Mostly Open
Depth (ft)	
Riffle	0.7
Run	1.0
Pool	2.0
% of Reach	
Riffle	10
Run	80
Pool	10
% Substrate	
Bedrock	52
Cobble	5
Gravel	15
Sand	20
Silt	5
Organic Matter	3

Table 3. Results of the habitat assessment survey conducted on Buxahatchee Creek at BXHS-3A, April 30, 2019.

Habitat Survey	% Max Score	Rating
Instream Habitat Quality	68	Sub-optimal (55-74.999)
Sediment Deposition	50	Marginal/Sub-optimal (50-54.999)
Riffle Frequency	90	Optimal (80-100)
Bank Vegetative Stability	56	Sub-optimal (55-74.999)
Riparian Zone Measurements	40	Marginal (30-49.999)
Habitat Assessment Score	117	
% Maximum Score	59	Sub-optimal (55-69.999)

Table 4. Results of the macroinvertebrate bioassessment conducted on Buxahatchee Creek at BXHS-3A, April 30, 2019.

Macroinvertebrate Assessment	Scores
Taxonomic richness and diversity metrics	
Taxa Count	41
# rare and highly sensitive taxa	2
# sensitive taxa	5
# sensitive EPT taxa	2
Percent taxon metrics	
% rare and highly sensitive taxa	5
% sensitive taxa	12
% sensitive EPT taxa	5
% highly tolerant taxa	20
Percent individual metrics	
% rare and highly sensitive individuals	1
% sensitive individuals	1
% sensitive EPT individuals	0
% tolerant individuals	35
WMB-I Survey Score	4.5
WMB-I Survey Rating	Poor-fair (4.5-4.849)

WATER CHEMISTRY

Results of water chemistry are presented in Table 5. In situ measurements and water samples were collected monthly from March to October of 2019 to help identify any stressors to the biological communities.

Water temperature, dissolved oxygen, and pH exceeded the criterion established for the *F&W* water use classification. Median total dissolved solids, specific conductance, alkalinity, nitrate-nitrite nitrogen, total nitrogen, dissolved reactive phosphorus and chloride values were higher than the median concentration of all verified ecoregional reference reach data collected in ecoregion 45a. *E. coli* exceeded the *F&W* human health criteria for a single sampling event.

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 *poor-fair* condition. Overall habitat quality was categorized as *sub-optimal*. Results from water quality sampling indicated that water temperature, dissolved oxygen, and pH exceeded the criterion established for the *F&W* water use classification. Median total dissolved solids, specific conductance, alkalinity, nitrate-nitrite nitrogen, total nitrogen, dissolved reactive phosphorus and chloride values were higher than the median concentration of all verified ecoregional reference reach data collected in ecoregion 45a. *E. coli* exceeded the *F&W* human health criteria for a single sampling event.

Table 5. Summary of water quality data collected March-October, 2019. 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.

BXHS-3A AL03150107-0405-100	N	Min	Max	Med	Avg	SD	E	10thP	90thP
Physical									
Temperature (°C)	17	9.0	32.2 ^C	26.7	24.4	6.5	1	11.4	30.9
Turbidity (NTU)	17	2.2	21.6	5.0	7.4	6.1		2.2	20.0
Total Dissolved Solids (mg/L)	8	151.0	414.0	214.0 ^M	245.5	94.1		151.0	414.0
Total Suspended Solids (mg/L)	8	<1.0	18.0	2.5	4.6	5.6		0.5	18.0
Specific Conductance (µmhos/cm)	17	213.9	672.8	446.7 ^G	440.4	138.6		226.5	668.0
Alkalinity (mg/L)	8	93.4	173.0	148.0 ^M	137.9	28.3		93.4	173.0
Measured Stream Flow (cfs)	17	0.2	21.8	1.7	3.4	5.1		0.3	14.1
Chemical									
Dissolved Oxygen (mg/L)	17	0.0 ^C	16.4	10.7	10.4	3.8	1	3.5	16.3
pH (SU)	17	7.6	8.9 ^C	8.1	8.1	0.4	3	7.6	8.8
Ammonia Nitrogen (mg/L)	8	<0.004	0.061	0.012	0.021	0.021		0.002	0.061
Nitrate+Nitrite Nitrogen (mg/L)	8	0.071	2.270	0.207 ^M	0.470	0.736		0.071	2.270
Total Kjeldahl Nitrogen (mg/L)	8	<0.200	0.517	0.340	0.342	0.131		0.100	0.517
Total Nitrogen (mg/L)	8	<0.308	2.704	0.597 ^M	0.812	0.777		0.308	2.704
Dis Reactive Phosphorus (mg/L)	8	<0.005	0.095	0.022 ^M	0.031	0.029		0.002	0.095
Total Phosphorus (mg/L)	8	0.018	0.113	0.036	0.045	0.030		0.018	0.113
CBOD-5 (mg/L)	8	<2.0	<2.0	1.0	1.0	0.0		1.0	1.0
Chlorides (mg/L)	8	3.2	56.9	8.8 ^M	19.6	19.7		3.2	56.9
Sulfate (mg/L)	8	11.50	102.00	22.70	36.85	31.13		11.50	102.00
Biological									
Chlorophyll a (mg/m³)	7	<1.00	2.14	1.07	1.29	0.61		0.50	2.14
<i>E. coli</i> (MPN/DL)	16	8.5	920.8 ^H	68.6	188.8	285.3	1	12.2	893.6
2019 - <i>E. coli</i> Summer	6				150.2				
2019 - <i>E. coli</i> Winter	5				22.9				

C=*F&W* criterion violated; E=# samples that exceeded criteria; H=*F&W* human health criterion exceeded; J=estimate; M=value >90% of all verified ecoregional reference reach data collected in the ecoregion 45a; G= value higher than median concentration of all verified ecoregional reference reach data collected in the ecoregion [45a]; N=# samples.

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