

2013 Monitoring Summary



Buzzard Roost Creek at Colbert County Road 21 (34.69831/-87.98914)

BACKGROUND

Buzzard Roost Creek is one of the streams the Alabama Department of Environmental Management (ADEM) is monitoring as a candidate for “best attainable condition” reference watershed for comparison with streams throughout the Transition Hills ecoregion.

Additionally, Buzzard Roost Creek was selected for biological and water quality monitoring as part of the 2013 Assessment of the Tennessee River Basin. The objectives of the Tennessee Basin Assessments were to assess the biological integrity of each site and to estimate overall water quality within the basin.



Figure 1. Buzzard Roost Creek at BZDC-1, April 9, 2013.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Buzzard Roost Creek is a Fish and Wildlife (F&W) stream that drains approximately 26 square miles in Colbert County. Based on the 2006 National Land Cover Dataset, landuse within the watershed is primarily forest (80%), with some areas of shrub/scrub, and very little pasture/cropland. Population density is low, as is the percentage of developed land (<4%). As of May 13, 2013, ADEM has issued five NPDES permits in this watershed.

REACH CHARACTERISTICS

General observations (Figure 1, Table 2) and habitat assessments (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. Buzzard Roost Creek at BZDC-1 is a low-gradient, mostly shaded stream characterized predominantly by sandy substrate. An even distribution of boulder, cobble, gravel, mud, silt, and organic matter substrates comprise the remainder of this reach. Overall habitat quality and availability was rated as *marginal* for supporting the macroinvertebrate community. This is primarily due to low channel sinuosity and bank stability, along with a poor riparian buffer.

BIOASSESSMENT RESULTS

The benthic macroinvertebrate community was 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. The final score is the average of all individual metric scores. The final score indicated the biological community at BZDC-1 to be in *fair* condition (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Tennessee River
Drainage Area (mi ²)		26
Ecoregion ^a		65j
% Landuse		
Open water		<1
Wetland	Woody	<1
	Emergent herbaceous	<1
Forest	Deciduous	65
	Evergreen	10
	Mixed	5
Shrub/scrub		15
Pasture/hay		1
Cultivated crops		1
Development	Open space	2
	Low intensity	<1
	Moderate intensity	<1
Population/km ^{2b}		2
# NPDES Permits ^c	TOTAL	4
	Construction Stormwater	2
	Mining	
	Industrial General	1
	Industrial Individual	2

a. Transition Hills

b. 2000 US Census

c. #NPDES permits downloaded from ADEM’s NPDES Management System database, May 13, 2013.

Table 2. Physical characteristics of Buzzard Roost Creek at BZDC-1, June 4, 2013.

Physical Characteristics		
Width (ft)		22
Canopy Cover		Mostly Shaded
Depth (ft)	Riffle	0.5
	Run	1.0
	Pool	3.0
% of Reach	Riffle	15
	Run	10
	Pool	75
% Substrate	Boulder	10
	Clay	4
	Cobble	10
	Mud/Muck	10
	Gravel	10
	Sand	35
	Silt	10
	Organic Matter	11

Table 3. Results of the habitat assessment conducted on Buzzard Roost Creek at BZDC-1, June 4, 2013.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	54	Sub-optimal (53-65)
Sediment Deposition	53	Sub-optimal (53-65)
Sinuosity	63	Marginal (45-64)
Bank and Vegetative Stability	38	Marginal (35-59)
Riparian Buffer	48	Poor (<50)
Habitat Assessment Score	123	
% Maximum Score	51	Marginal (40-52)

Table 4. Results of macroinvertebrate assessment conducted in Buzzard Roost Creek at BZDC-1, June 4, 2013.

Macroinvertebrate Assessment			
	Results	Scores (0-100)	
Taxa richness and diversity measures			
# EPT taxa	23	83	
Shannon Diversity	3.86	54	
Taxonomic composition measures			
% EPT minus Baetidae and Hydropsychidae	6	11	
% Non-insect taxa	16	31	
Functional feeding group			
% Predator Individuals	5	15	
Community tolerance			
% Tolerant taxa	27	64	
WMB-I Assessment Score	---	43	
WMB-I Assessment Rating		Fair (29-43)	

WATER CHEMISTRY

Results of water chemistry analyses are summarized in Table 5. In situ measurements and water samples were collected in April, June, August, and October 2013 to help identify any stressors to the biological community. Conductivity, dissolved iron, and dissolved manganese were higher than expected based on reference reach data for streams in ecoregion 65j. Dissolved arsenic concentrations were higher than expected for *F&W* streams based on human-health criteria for fish consumption on June, August, and October sampling dates. Dissolved chromium concentrations were also higher than expected for *F&W* streams on the same dates. Additionally, the summer geometric mean for *E. coli* exceeded the *F&W* human-health criterion.

SUMMARY

ADEM monitored Buzzard Roost Creek at BZDC-1 in 2013 to determine the suitability of classifying it a "best attainable" condition reference watershed. Landuse and population density categorize Buzzard Creek among the least-disturbed watersheds in the Tennessee basin. Water quality data indicates the stream to have elevated conductivity and concentrations of dissolved iron, manganese, arsenic, and chromium. Also, *E. coli* counts exceeded the *F&W* human health criterion in the summer. Bioassessment results show the macroinvertebrate community to be in *fair* condition. Elevated water quality parameters along with *marginal* habitat conditions indicate a need for further monitoring to identify causes and sources of the degraded biological conditions.

Although samples of total dissolved arsenic were above expected values in Buzzard Roost Creek, ADEM criteria for arsenic are expressed as dissolved trivalent arsenic (arsenite—As III). Presently, studies are being conducted in order to provide a better understanding of the prevalence and areal distribution of dissolved trivalent arsenic to total arsenic in the State of Alabama. Upon conclusion of the studies, Buzzard Roost Creek will be reassessed for potential arsenic violations.

Table 5. Summary of water quality data collected April-October, 2013. 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	Q
Physical								
Temperature (°C)	5	15.2	24.0	22.6	20.6	3.7		
Turbidity (NTU)	9	5.7	10.0	7.5	7.6	1.6		
Total Dissolved Solids (mg/L)	4	46.0	82.0	71.0	67.5	15.3		
Total Suspended Solids (mg/L)	4	3.0	10.0	5.5	6.0	3.2		
Specific Conductance (µmhos)	5	89.6	117.7	105.4 ^G	105.8	11.3		
Hardness (mg/L)	4	40.7	51.8	46.1	46.2	6.2		
Alkalinity (mg/L)	4	36.5	51.5	46.8	45.4	7.2		
Stream Flow (cfs)	7	2.6	33.0	3.2	8.9	11.0		
Chemical								
Dissolved Oxygen (mg/L)	5	6.7	9.2	7.4	7.6	1.0		
pH (su)	5	6.8	7.2	7.0	7.0	0.2		
^J Ammonia Nitrogen (mg/L)	4	< 0.004	0.018	0.010	0.010	0.008		
^J Nitrate+Nitrite Nitrogen (mg/L)	4	< 0.004	0.041	0.028	0.024	0.018		
^J Total Kjeldahl Nitrogen (mg/L)	4	0.065	0.345	0.257	0.231	0.118		
^J Total Nitrogen (mg/L)	4	0.067	0.381	0.287	0.256	0.133		
^J Dissolved Reactive Phosphorus (mg/L)	4	< 0.004	0.007	0.005	0.005	0.002		
^J Total Phosphorus (mg/L)	4	0.007	0.020	0.016	0.015	0.006		
CBOD-5 (mg/L)	4	< 2.0	< 2.0	1.0	1.0	0.0		
Chlorides (mg/L)	4	1.3	1.8	1.4	1.5	0.2		
Total Metals								
^J Aluminum (mg/L)	4	0.100	0.441	0.182	0.226	0.157		
Iron (mg/L)	4	0.326	0.709	0.694	0.606	0.187		
^J Manganese (mg/L)	4	0.027	0.065	0.034	0.040	0.017		
Dissolved Metals								
Aluminum (mg/L)	4	< 0.076	< 0.076	0.038	0.038	0.000		
Antimony (µg/L)	4	< 0.1	< 2.6	0.1	0.4	0.6		
^J Arsenic (µg/L)	4	0.4	< 1.4 ^A	0.7	0.6	0.1		3
Cadmium (µg/L)	4	< 0.046	< 0.170	0.085	0.070	0.031		
^J Chromium (µg/L)	4	0.619	< 32.000 ^S	0.724	4.517	7.656		3
^J Copper (mg/L)	4	< 0.0003	< 0.0310	0.0003	0.0040	0.0079		
^J Iron (mg/L)	4	0.085	0.491	0.372 ^M	0.330	0.192		
Lead (µg/L)	4	< 0.1	< 1.1	0.1	0.2	0.2		
^J Manganese (mg/L)	4	0.024	0.059	0.026 ^M	0.034	0.017		
Mercury (µg/L)	1			< 0.057				
^J Nickel (mg/L)	4	0.000	< 0.016	0.000	0.002	0.004		
Selenium (µg/L)	4	< 0.2	< 1.4	0.1	0.3	0.3		
Silver (µg/L)	4	< 0.215	< 2.120	1.060	0.822	0.476		
Thallium (µg/L)	4	< 0.1	< 1.1	0.1	0.2	0.2		
^J Zinc (mg/L)	4	0.003	< 0.017	0.003	0.004	0.003		
Biological								
Chlorophyll a (ug/L)	4	< 0.10	0.53	0.05	0.17	0.24		
<i>E. coli</i> (col/100mL)	4	115	435 ^H	179	227	144		1

E=# samples that exceeded criteria; J=estimate; N=# samples; Q=# of uncertain exceedances; M=value > 90% of ADEM's verified reference reaches collected in ecoregion 65j; G=value higher than median of all verified ecoregional reference reach data collected in ecoregion 65j; A=metals not adjusted for hardness; S=metals adjusted for hardness; H=*F&W* human health criterion exceeded.

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