

2009 Monitoring Summary



Big Coon Creek in Jackson County at County Road 55 (34.85659/-85.92684)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Big Coon Creek watershed for biological and water quality monitoring as part of the 2009 Tennessee (TN) Basin Monitoring. Big Coon Creek has been counted among the least disturbed watersheds in the Sequatchie Valley ecoregion (68b) based on land use, road density, and population density; therefore, it has been selected as an ecological reference reach candidate. The 2009 data will be used to assess the biological integrity of the site and estimate overall water quality within the Tennessee River Basin. The data will also be used to evaluate the possible use of Big Coon Creek as a “best attainable” condition reference watershed for comparison with other streams in this ecoregion.

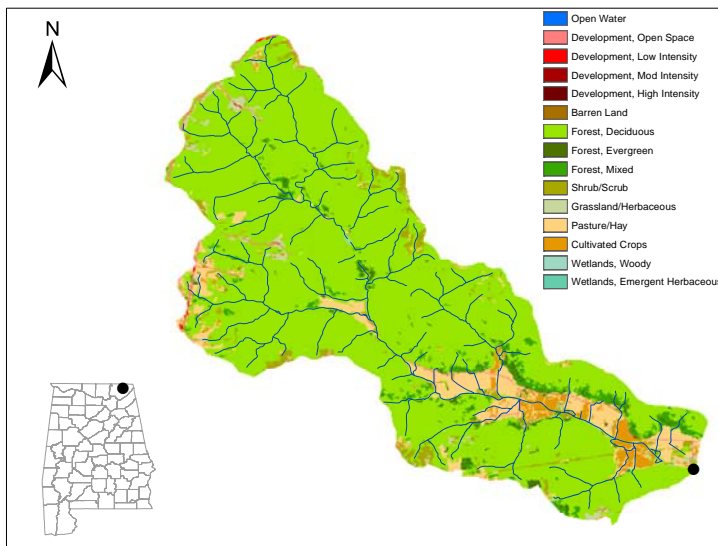


Figure 1. Sampling location and landuse within the Big Coon Creek watershed at BCNJ-1.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Big Coon Creek at BCNJ-1 is a large *Fish & Wildlife (F&W)* creek located within the Sequatchie Valley ecoregion in Jackson County. Based on the 2000 National Land Cover Dataset, landuse within the watershed is composed primarily of deciduous forest (Figure 1). Pasture/hay and agricultural land uses within the watershed are concentrated along the creek, upstream of BCNJ-1. Population is low in the area with little development. As of February 23, 2011, ADEM’s NPDES Management System database does not show any permitted discharges 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. Big Coon Creek at BCNJ-1 is a low-gradient stream. Instream substrates were dominated by gravel and sand, with some organic matter. Habitat quality and availability within the reach were rated *sub-optimal* for supporting 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. The final score is the average of all individual metric scores. Metric results indicated the macroinvertebrate community to be characterized by pollution-intolerant taxa groups, indicating *good* community condition (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin	Tennessee River	
Drainage Area (mi²)	42	
Ecoregion^a	68b	
% Landuse		
Open water		<1
Wetland	Woody	<1
Forest	Deciduous	80
	Evergreen	1
	Mixed	4
Shrub/scrub		3
Grassland/herbaceous		1
Pasture/hay		7
Cultivated crops		2
Development	Open space	1
	Low intensity	<1
Barren		<1
Population/km^{2b}	3	

a. Sequatchie Valley
b. 2000 US Census

Table 2. Physical characteristics of Big Coon Creek at BCNJ-1, June 10, 2009.

Physical Characteristics		
Width (ft)	40	
Canopy Cover	Mostly Open	
Depth (ft)	Run	1.5
	Pool	4.0
% of Reach		
	Run	85
	Pool	15
% Substrate		
	Cobble	1
	Gravel	47
	Sand	40
	Silt	2
	Organic Matter	10

Table 3. Results of the habitat assessment conducted on Big Coon Creek at BCNJ-1, June 10, 2009.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	68	Sub-optimal (59-70)
Sediment Deposition	76	Optimal >70
Sinuosity	33	Poor <45
Bank and Vegetative Stability	73	Sub-optimal (60-74)
Riparian Buffer	73	Sub-optimal (70-89)
Habitat Assessment Score	151	
% Maximum Score	68	Sub-optimal (59-70)

Table 4. Results of the macroinvertebrate bioassessment conducted in Big Coon Creek at BCNJ-1, June 10, 2009.

Macroinvertebrate Assessment			
	Result	Scores	Rating
Taxa richness measures			
# EPT genera	17	68	Good (57-78)
Taxonomic composition			
% Non-insect taxa	15	50	Poor (30.9-61.8)
% Plecoptera	0	0	Very Poor
% Dominant taxa	12	96	Excellent (>85.2)
Functional composition measures			
% Predators	25	87	Excellent (>72.1)
Tolerance measures			
Beck's community tolerance	3	14	Poor (10.6-21.2)
% Nutrient tolerant organisms	9	100	Excellent (>88.1)
WMB-I Assessment Score	-	59	Good (57-78)

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 BCNJ-1 on March 18th, April 22nd, and July 22nd. All parameters were below detection limits. The median values of several physical parameters, nitrate+nitrite nitrogen, and dissolved reactive phosphorus were higher than expected based on reference data collected in the Southwestern Appalachians ecoregion. Dissolved arsenic exceeded criteria applicable to Big Coon Creek's F&W use classification. Estimated concentrations of lead also appear to be elevated. All nutrient (with the exception of nitrate+nitrite nitrogen and dissolved reactive phosphorus) and mercury samples were excluded from analysis because they did not meet ADEM's laboratory QC requirements.

SUMMARY

Overall habitat quality was categorized as *sub-optimal*. Although physical parameters, nutrients, arsenic, and lead were higher than expected, bioassessment results indicated the macroinvertebrate community to be in *good* condition. 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) 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)	9	12.6	24.1	16.3	17.3	4.3		
Turbidity (NTU)	9	2.7	22.0	6.3	8.4	5.6		
Total Dissolved Solids (mg/L)	8	103.0	168.0	133.0 ^M	135.8	18.4		
Total Suspended Solids (mg/L)	8	1.0	6.0	3.5	3.8	1.6		
Specific Conductance (µmhos)	9	169.0	321.0	218.0 ^G	224.8	51.8		
Hardness (mg/L)	4	67.3	176.0	94.1 ^G	107.9	48.5		
Alkalinity (mg/L)	8	78.2	151.0	104.0 ^M	109.9	28.1		
Stream Flow (cfs)	6	0.0	123.9	36.0	44.8	44.4		
Chemical								
Dissolved Oxygen (mg/L)	9	5.2	10.5	8.7	8.6	1.8		
pH (su)	9	7.5	7.8	7.8	7.7	0.1		
^B Ammonia Nitrogen (mg/L)	0							
^J Nitrate+Nitrite Nitrogen (mg/L)	8	< 0.003	2.016	1.064 ^M	0.949	0.715		
^B Total Kjeldahl Nitrogen (mg/L)	0							
^B Total Nitrogen (mg/L)	0							
^J Dissolved Reactive Phosphorus (mg/L)	8	< 0.008	0.092	0.053 ^M	0.050	0.043		
^B Total Phosphorus (mg/L)	0							
CBOD-5 (mg/L)	8	< 1.0	< 1.0	0.5	0.5	0.0		
Chlorides (mg/L)	8	0.7	10.5	1.3	3.9	4.1		
Atrazine (µg/L)	3	< 0.06	< 0.06	0.03	0.03	0.00		
Total Metals								
^J Aluminum (mg/L)	4	< 0.060	0.334	0.217	0.200	0.148		
^J Iron (mg/L)	4	0.159	0.373	0.238	0.252	0.096		
^J Manganese (mg/L)	4	0.018	0.058	0.032	0.035	0.017		
Dissolved Metals								
^J Aluminum (mg/L)	4	0.036	< 0.060	0.030	0.032	0.003		
Antimony (µg/L)	4	< 0.5	< 6.0	3.0	2.3	1.4		
^J Arsenic (µg/L)	4	< 0.4	0.5 ^H	0.2	0.3	0.2	1	
Cadmium (mg/L)	4	< 0.000	< 0.002	0.001	0.001	0.000		
Chromium (mg/L)	4	< 0.007	< 0.007	0.004	0.004	0.000		
Copper (mg/L)	4	< 0.200	< 0.200	0.100 ^M	0.100	0.000		
^J Iron (mg/L)	4	< 0.020	0.054	0.041	0.036	0.019		
^J Lead (µg/L)	4	< 0.5	4.7 ^S	0.8	1.6	2.1		1
^J Manganese (mg/L)	4	0.014	0.069	0.024	0.033	0.025		
^B Mercury (µg/L)	0							
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		
Biological								
Chlorophyll a (µg/L)	8	< 1.00	4.54	0.50	1.08	1.41		
^J Fecal Coliform (col/100 mL)	8	6	310	58	85	94		
^J E. coli (col/100mL)	2	63	249	156	156	132		

B=samples excluded due to laboratory QC concerns; E=# samples that exceeded criteria; G=value higher than median concentration of all verified ecoregional reference reach data collected in the ecoregion 68; H=F&W human health criteria exceeded; J=estimate; M=value >90% of all verified ecoregional reference reach data collected in the ecoregion 68; N=# sample; Q=# of uncertain exceedances; S=F&W hardness-adjusted aquatic life use criteria exceeded.