

2010 Monitoring Summary



Basin Assessment Site

Big Canoe Creek at St. Clair County Road 36 (33.83277/-86.28348)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Big Canoe Creek watershed for biological and water quality monitoring as part of the Alabama-Coosa-Tallapoosa (ACT) Basin Assessment. The objectives of the ACT Basin Assessments were to assess the biological integrity of each monitoring site and to estimate overall water quality within the ACT basin group. Data from the project will also be used for metric and criteria development.

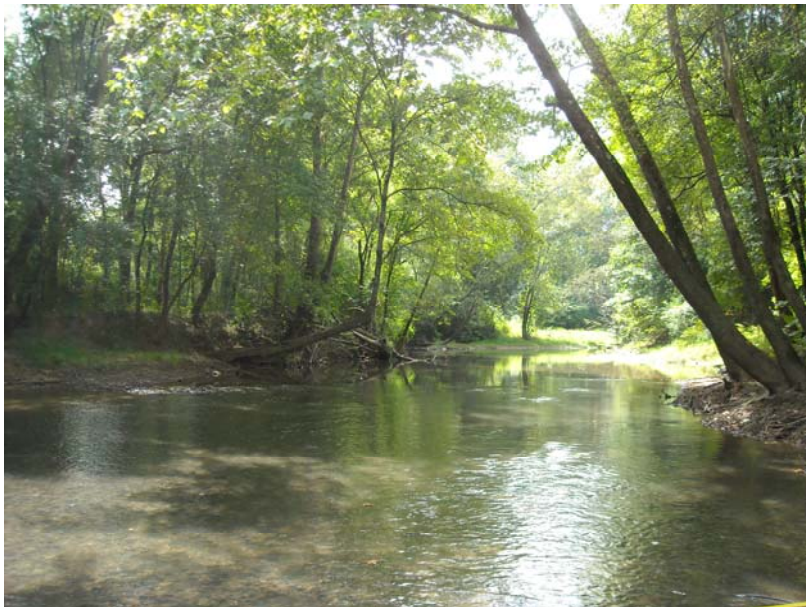


Figure 1. Big Canoe Creek at BCNS-24, September 9, 2010.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Big Canoe Creek is a *Fish & Wildlife (F&W)* stream that drains 112 square miles of the Ridge and Valley region in St. Clair County. Based on the 2006 National Land Cover Dataset, landuse within the watershed is primarily forest (64%), with some pasture/hay. As of February 23, 2011, the ADEM has issued 109 NPDES permits in 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 Canoe Creek at BCNS-24 is a low gradient stream with a primarily sand and gravel bottom in the Southern Shale Valleys sub-ecoregion (67g) (Figure 1). Overall habitat quality was categorized as *sub-optimal* for supporting a diverse macroinvertebrate community.

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 scores of all individual metrics. Metric results indicated the macroinvertebrate community to be in *fair* condition, due to a low diversity of sensitive insect taxa (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Coosa River
Drainage Area (mi²)		112
Ecoregion^a		67g
% Landuse		
Open water		<1
Wetland	Woody	2
Forest	Deciduous	49
	Evergreen	10
	Mixed	5
Shrub/scrub		3
Grassland/herbaceous		5
Pasture/hay		17
Cultivated crops		2
Development	Open space	5
	Low intensity	<1
	Moderate intensity	<1
	High intensity	<1
	Barren	<1
Population/km^{2b}		89
# NPDES Permits	TOTAL	109
401 Water Quality Certification		2
Construction Stormwater		94
Mining		3
Industrial General		2
Municipal Individual		8

a. Southern Shale Valleys

b. 2000 US Census

c. #NPDES permits downloaded from ADEM's NPDES Management System database, February 23, 2011

Table 2. Physical characteristics of Big Canoe Creek at BCNS-24, May 20, 2010.

Physical Characteristics		
Width (ft)		50
Canopy Cover		Mostly Open
Depth (ft)		
	Run	2.0
	Pool	2.5
% of Reach		
	Run	80
	Pool	20
% Substrate		
	Cobble	3
	Mud/Muck	2
	Gravel	27
	Sand	50
	Silt	7
	Organic Matter	11

Table 3. Results of the habitat assessment conducted in Big Canoe Creek at BCNS-24, May 20, 2010.

Habitat Assessment	% Maximum Score	Rating
Instream Habitat Quality	60	Sub-Optimal (53-65)
Sediment Deposition	71	Optimal (>65)
Sinuosity	60	Marginal (45-<65)
Bank and Vegetative Stability	46	Marginal (35-<59)
Riparian Buffer	68	Marginal (50-<70)
Habitat Assessment Score	122	
% Maximum Score	61	Sub-Optimal (53-65)

Table 4. Results of the macroinvertebrate bioassessment conducted in Big Canoe Creek at BCNS-24, May 20, 2010.

Macroinvertebrate Assessment		Results
Taxa richness and diversity measures		
# EPT taxa		16
Taxonomic composition measures		
% Non-insect taxa		15
% Plecoptera		0
% Dominant taxon		17
Functional feeding group		
% Predators		4
Community tolerance		
Becks community tolerance index		4
% Nutrient tolerant individuals		25
WMB-I Assessment Score		44
WMB-I Assessment Rating		Fair (37-55)

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. *In situ* measurements and water samples were collected May, July, September, and November of 2010 to help identify any stressors to the biological community. Median concentrations of specific conductance, hardness, nitrate+nitrite nitrogen, chlorides, copper, and dissolved manganese were higher than background levels based on reference reach data collected in ecoregion 67 (Ridge and Valley). Mercury exceeded *F&W* aquatic-life-use and human-health criteria in September and November. Atrazine concentrations were above the minimum detection limit in the sample collected on May 26, 2010. Stream flow on that date was 116.3 cfs, the highest recorded discharge measured during the sampling period.

SUMMARY

Bioassessment results indicated the macroinvertebrate community to be in *fair* condition. Overall habitat conditions were rated as *sub-optimal* for supporting the biological community. Mercury concentrations exceeded *F&W* use classification criterion and human health criterion on two sampling events. Median specific conductance, hardness, nitrate+nitrite nitrogen, chlorides, copper, and dissolved manganese were elevated as compared to data from ADEM's least-impaired reference reaches in ecoregion 67. The data presented in this report and all other available data will be reviewed to identify the causes and sources of the degrading biological conditions.

Table 5. Summary of water quality data collected May-November, 2010. 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	E	Q
Physical								
Temperature (°C)	5	9.7	25.5	21.7	20.2	6.2		
Turbidity (NTU)	5	3.6	15.5	10.4	9.6	4.4		
Total Dissolved Solids (mg/L)	4	120.0	152.0	144.5	140.2	14.9		
Total Suspended Solids (mg/L)	4	7.0	13.0	8.5	9.2	2.6		
Specific Conductance (µmhos)	5	197.0	287.0	254.0 ^z	237.8	34.0		
Hardness (mg/L)	4	93.4	132.0	126.0 ^z	119.4	17.8		
Alkalinity (mg/L)	4	78.8	126.4	106.0	104.3	19.6		
Monthly Stream Flow (cfs)	5	17.7	116.3	31.5	49.4	41.4		
Stream Flow during Sample Collection (cfs)	5	17.7	116.3	31.5	49.4	41.4		
Chemical								
Dissolved Oxygen (mg/L)	5	6.9	10.4	8.0	8.2	1.4		
pH (su)	5	7.4	7.7	7.6	7.8	0.2		
Ammonia Nitrogen (mg/L)	1				0.500			
Nitrate+Nitrite Nitrogen (mg/L)	4	0.033	0.296	0.268 ^v	0.216	0.123		
^J Dissolved Reactive Phosphorus (mg/L)	4	0.010	0.021	0.016	0.016	0.005		
CBOD-5 (mg/L)	4	< 1.0	< 1.0	0.5	0.5	0.0		
Chlorides (mg/L)	4	2.6	27.0	17.5 ^v	16.2	12.0		
^J Atrazine (µg/L)	2	< 0.02	0.05	0.03	0.03	0.03		
Total Metals								
^J Aluminum (mg/L)	4	0.037	0.411	0.284	0.254	0.162		
Iron (mg/L)	4	0.206	0.473	0.276	0.308	0.115		
^J Manganese (mg/L)	4	0.033	0.071	0.057	0.054	0.016		
Dissolved Metals								
Aluminum (mg/L)	4	< 0.020	< 0.020	0.010	0.010	0.000		
Antimony (µg/L)	4	< 0.5	< 0.5	0.2	0.2	0.0		
^J Arsenic (µg/L)	4	< 1.0	1.4 ^h	0.5	0.7	0.4	1	
^J Cadmium (µg/L)	4	< 0.400	< 0.400	0.200	0.200	0.000		
Chromium (µg/L)	4	< 2.000	< 2.000	1.000	1.000	0.000		
Copper (mg/L)	4	< 0.200	< 0.200	0.100 ^v	0.100	0.000		
^J Iron (mg/L)	4	< 0.030	0.057	0.032	0.034	0.022		
^J Lead (µg/L)	4	< 2.0	< 2.0	1.0	1.0	0.0		
^J Manganese (mg/L)	4	0.022	0.040	0.028 ^v	0.030	0.009		
^J Mercury (µg/L)	3	< 0.200	0.350 ^h	0.335	0.262	0.140	2	
Nickel (mg/L)	4	< 0.005	< 0.005	0.002	0.002	0.000		
Selenium (µg/L)	4	< 1.2	< 1.2	0.6	0.6	0.0		
Silver (µg/L)	4	< 1.000	< 1.000	0.500	0.500	0.000		
Thallium (µg/L)	4	< 0.7	< 0.7	0.4	0.4	0.0		
Zinc (mg/L)	4	< 0.030	< 0.030	0.015	0.015	0.000		
Biological								
Chlorophyll a (µg/L)	4	< 1.00	1.07	0.78	0.78	0.33		
^J E. coli (col/100mL)	4	50	108	100	90	26		

A=*F&W* aquatic life use criterion exceeded; E=# samples that exceeded criteria; G=value higher than median concentration of all verified ecoregional reference reach data collected in ecoregion 67; H=*F&W* human health criterion exceeded; J=estimate; M=value >90% percent of all verified ecoregional reference reach data collected in ecoregion 67; N=# samples; Q=# uncertain exceedances.

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