

2010 Monitoring Summary



Rock Creek at Winston County Road 66 (34.15788/-87.16438)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected Rock Creek for biological and water quality monitoring in order to fulfill the requirements of Section 319(b) of the Clean Water Act. Under this section, it is mandated that all states develop and implement non-point source monitoring programs using shared information and experience with the goal of reducing the amount of surface run-off and other man-made sources of pollution.

Rock Creek was identified on the 1998 CWA Section 303(d) Lists of Impaired Waters. It was listed for impairments caused by organic enrichment/low dissolved oxygen and pathogens. The sources of impairments include pasture grazing and intensive animal feeding operations.

This creek was monitored in 2010 to document water quality conditions before the implementation of the Rock Creek Watershed Management Plan (WMP), which was developed to improve overall water quality within the impaired waterbody. Nonpoint source controls to be implemented in the Rock Creek watershed include livestock fencing, alternative water supplies, animal water management and irrigation, agronomic practices, dead animal disposal, nutrient management, and alternative tillage practices with other forms of erosion control.



Figure 1. Rock Creek at ROCW-1 taken May 27, 2010.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Rock Creek is a *Fish & Wildlife (F&W)* stream located south of the city of Addison in Winston County. Based on the 2000 National Land Cover Dataset, land use within the watershed is primarily forest (52%) and pasture/hay. ADEM has issued 22 NPDES discharge permits in this 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. Rock Creek at ROCW-1 is a low-gradient stream reach characterized by sand and bedrock substrates (Figure 1). Overall habitat quality was categorized as *marginal* due to bank erosion and limited instream habitat.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		Black Warrior River
Basin		
Drainage Area (mi²)		79
Ecoregion^a		68e
% Landuse		
Open water		<1
Wetland	Woody	1
	Emergent herbaceous	<1
Forest	Deciduous	29
	Evergreen	11
	Mixed	12
Shrub/scrub		5
Grassland/herbaceous		2
Pasture/hay		33
Cultivated crops		2
Development	Open space	4
	Low intensity	1
	Moderate intensity	<1
	High intensity	<1
Barren		<1
Population/km^{2b}		33
# NPDES Permits^c	TOTAL	22
	Construction Stormwater	10
	Industrial General	6
	Industrial Individual	1
	Municipal Individual	4
	Underground Injection Control	1

a. Dissected Plateau

b. 2000 US Census

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

Table 2. Physical characteristics of Rock Creek at ROCW-1, May 27, 2010.

Physical Characteristics	
Width (ft)	38
Canopy Cover	Mostly Open
Depth (ft)	
	Run 3.0
	Pool 4.0
% of Reach	
	Run 90
	Pool 10
% Substrate	
	Bedrock 15
	Boulder 5
	Clay 2
	Cobble 2
	Gravel 3
	Sand 64
	Silt 3
	Organic Matter 6

Table 3. Results of the habitat assessment conducted on Rock Creek at ROCW-1, May 27, 2010.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	51	Marginal (41-58)
Sediment Deposition	66	Sub-optimal (59-70)
Sinuosity	48	Marginal (45-64)
Bank and Vegetative Stability	44	Marginal (35-59)
Riparian Buffer	79	Sub-optimal (70-89)
Habitat Assessment Score	126	
% Maximum Score	57	Marginal (41-58)

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 in *fair* condition (Table 4).

Table 4. Results of the macroinvertebrate bioassessment conducted in Rock Creek at ROCW-1, May 27, 2010.

Macroinvertebrate Assessment			
	Results	Scores	Rating
Taxa richness measures			
# EPT genera	14	56	Fair (38-56)
Taxonomic composition measures			
% Non-insect taxa	11	72	Fair (61.9-92.7)
% Plecoptera	2	12	Good (5.7-52.8)
% Dominant taxa	16	86	Excellent (>85.2)
Functional composition measures			
% Predators	15	51	Good (45.3-72.1)
Tolerance measures			
Beck's community tolerance index	6	27	Fair (21.3-31.8)
% Nutrient tolerant organisms	17	88	Good (76.3-88.1)
WMB-I Assessment Score	--	56	Fair (38-56)

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. When possible, in situ measurements and water samples were collected July, September, and November of 2010 to identify any stressors to the biological community. Samples that did not meet ADEM's quality control requirements were not included in the data set. Median conductivity, hardness, chloride, total manganese, and dissolved copper and manganese concentrations were above background concentrations based on reference reach data collected in ecoregion 68e. Dissolved mercury concentrations exceeded human health and aquatic life use criteria on September 21, 2010.

SUMMARY

Bioassessment results indicated the macroinvertebrate community to be in *fair* condition. Overall habitat quality was categorized as *marginal*, due to limited habitat and eroding banks. Concentrations of some metals, chlorides, hardness, and conductivity were elevated as compared to data from ADEM's least-impaired reference reaches in ecoregion 68e. Monitoring should continue to ensure that water quality and biological conditions remain stable.

Table 5. Summary of water quality data collected in July, September, and November, 2010. Minimum (Min) and maximum (Max) values calculated using minimum detection limits (MDL) when results were less than this value for non-metals parameters. 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
Physical							
Temperature (°C)	4	10.1	27.4	23.1	20.9	7.5	
Turbidity (NTU)	4	1.0	36.7	2.4	10.6	17.4	
Total Dissolved Solids (mg/L)	3	37.0	69.0	54.0	53.3	16.0	
Total Suspended Solids (mg/L)	3	< 0.3	12.0	0.2	4.1	6.8	
Specific Conductance (µmhos)	4	60.6	85.0	68.5 ^G	70.6	11.2	
Hardness (mg/L)	3	15.2	24.1	19.7 ^G	19.7	4.4	
Alkalinity (mg/L)	3	21.5	28.7	23.7	24.6	3.7	
Stream Flow (cfs)	1				22.1		
Chemical							
Dissolved Oxygen (mg/L)	4	6.2	9.1	7.3	7.5	1.3	
pH (su)	4	7.0	7.5	7.2	7.2	0.2	
^{JB} Ammonia Nitrogen (mg/L)	1				0.500		
Nitrate+Nitrite Nitrogen (mg/L)	3	< 0.007	0.098	0.004	0.035	0.054	
^B Total Kjeldahl Nitrogen (mg/L)	0						
^B Total Nitrogen (mg/L)	0						
^J Dissolved Reactive Phosphorus (mg/L)	3	< 0.003	< 0.003	0.002	0.002	0.000	
^B Total Phosphorus (mg/L)	0						
^J CBOD-5 (mg/L)	3	< 1.0	< 1.0	0.5	0.5	0.0	
Chlorides (mg/L)	3	3.2	3.7	3.2 ^M	3.4	0.3	
Total Metals							
^J Aluminum (mg/L)	3	< 0.020	0.742	0.032	0.261	0.416	
Iron (mg/L)	3	0.226	1.070	0.456	0.584	0.436	
Manganese (mg/L)	3	0.053	0.215	0.117 ^M	0.128	0.082	
Dissolved Metals							
^J Aluminum (mg/L)	3	< 0.020	0.071	0.010	0.030	0.035	
Antimony (µg/L)	3	< 0.5	< 0.5	0.2	0.2	0.0	
Arsenic (µg/L)	3	< 1.0	< 1.0	0.5	0.5	0.0	
^J Cadmium (mg/L)	3	< 0.0004	< 0.0004	0.0004	0.0004	0.000	
Chromium (mg/L)	3	< 0.002	< 0.002	0.001	0.001	0.000	
Copper (mg/L)	3	< 0.200	< 0.200	0.100 ^M	0.100	0.000	
^J Iron (mg/L)	3	0.166	0.327	0.318	0.270	0.090	
^J Lead (µg/L)	3	< 2.0	< 2.0	1.0	1.0	0.0	
^J Manganese (mg/L)	3	0.044	0.195	0.086 ^M	0.108	0.078	
^{JB} Mercury (µg/L)	2	< 0.200	0.592 ^{AH}	0.346	0.346	0.348	1
Nickel (mg/L)	3	< 0.005	< 0.005	0.002	0.002	0.000	
Selenium (µg/L)	3	< 1.2	< 1.2	0.6	0.6	0.0	
Silver (mg/L)	3	< 0.001	< 0.001	0.000	0.000	0.000	
Thallium (µg/L)	3	< 0.7	< 0.7	0.4	0.4	0.0	
Zinc (mg/L)	3	< 0.030	< 0.030	0.015	0.015	0.000	
Biological							
Chlorophyll a (ug/L)	3	< 1.00	4.27	1.07	1.95	2.03	
^J E. coli (col/100mL)	3	5	1203	78	429	672	

A=F&W aquatic life use criteria exceeded; 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 68e; H=F&W human health criteria exceeded; J=estimate; M=value >90% of all verified ecoregional reference reach data collected in the ecoregion 68e; N=# samples.

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