Alabama Department of Environmental Management

Basin Assessment Site

Rivers and Streams Monitoring Program

2007 Monitoring Summary

Good™

Clear Creek at Winston County Road 81 (34.16618/-87.51326)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Clear Creek watershed for biological and water quality monitoring as part of the 2007 Assessment of the Black Warrior and Cahaba (BWC) River Basins. The objectives of the BWC Basin Assessments were to assess the biological integrity of each monitoring site and to estimate overall water quality within the BWC basin group.

Clear Creek was also rated as *poor* using ADEM's Screening Level Macroinvertebrate Bioassessment methods (WMB-EPT) during ADEM's 2002 Assessment of the Black Warrior and Cahaba (BWC) River Basins. Therefore, the reach was prioritized for further monitoring during the 2007 Basin Assessment of the BWC River Basins to verify biological conditions at the site as well as the extent and cause of any impairment.

Figure 1. Clear Creek at CLCW-53.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Black Warrior River
Drainage Area (mi^2)		20
Ecoregion[a]		68e
% Landuse		
Open water		<1
Wetland	Woody	1
Forest	Deciduous	25
	Evergreen	20
	Mixed	11
Shrub/scrub		7
Grassland/herbaceous		9
Pasture/hay		16
Cultivated crops		2
Development	Open space	5
	Low intensity	4
	Moderate intensity	1
	High intensity	<1
Barren		<1
Population/km^2[b]		50
# NPDES Permits[c]	**TOTAL**	13
Construction Stormwater		7
Mining		2
Industrial General		2
Industrial Individual		2

a.Dissected Plateau
b.2000 US Census
c.#NPDES permits downloaded from ADEM's NPDES Management System database, 9 Jun 2008

Table 2. Physical characteristics of Clear Creek at CLCW-53, June 6, 2007.

Physical Characteristics		
Width (ft)		20
Canopy cover		Shaded
Depth (ft)		
	Run	1
	Pool	3
% of Reach		
	Run	50
	Pool	50
% Substrate		
	Boulder	10
	Cobble	3
	Gravel	2
	Sand	75
	Silt	5
	Organic Matter	5

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Clear Creek is a *Fish & Wildlife (F&W)* stream located near the city of Double Springs in Winston County. According to the 2000 National Land Cover Dataset, landuse within the watershed is primarily forest (56%), with some pasture and grassland areas (25%). The presence of deciduous forest and pasture land are characteristic of streams in the Dissected Plateau. As of February 23, 2011, ADEM's NPDES Management database showed a total of 13 permitted discharges 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. Clear Creek at CLCW-53 is a low-gradient, sand-bottomed stream (Figure 1). Overall habitat quality was categorized as *sub-optimal* due to marginal sinuosity and reduced instream habitat quality.

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 *good* condition (Table 4).

Table 3. Results of the habitat assessment conducted in Clear Creek at CLCW-53, June 6, 2007.

Habitat Assessment	% Maximum Score	Rating
Instream Habitat Quality	47	Marginal (41-58)
Sediment Deposition	65	Sub-optimal (59-70)
Sinuosity	60	Marginal (45-64)
Bank and Vegetative Stability	70	Sub-optimal (60-74)
Riparian Buffer	84	Sub-optimal (70-89)
Habitat Assessment Score	**141**	
% Maximum score	**64**	**Sub-optimal (59-70)**

Table 4. Results of the macroinvertebrate bioassessment conducted in Clear Creek at CLCW-53, June 6, 2007.

Macroinvertebrate Assessment Results			
	Results	**Scores (0-100)**	**Rating**
Taxa richness measures			
# EPT genera	24	96	Excellent (>=79)
Functional composition measures			
% Predators	16	55	Good (45.3-72.1)
Taxonomic composition measures			
% Non-insect taxa	8	86	Fair (61.9-92.7)
% Plecoptera	9	44	Good (5.7-52.8)
% Dominant taxa	38	30	Poor (23.5-47.0)
Tolerance measures			
Beck's community tolerance index	20	91	Excellent
% Nutrient tolerant organisms	48	36	Poor (25.4-50.8)
WMB-I Assessment Score	**---**	**63**	**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, herbicides (atrazine), and semi-volatile organics) during March through October of 2007 to help identify any stressors to the biological communities. Copper concentrations exceeded hardness-adjusted aquatic life use criteria in one out of four sampling events. Median values of specific conductance, hardness, chlorides, iron, and manganese were above concentrations expected in this ecoregion.

SUMMARY

Habitat assessment for Clear Creek at CLCW-53 resulted in a *sub-optimal* rating. Bioassessment results indicated the macroinvertebrate community to be in *good* condition. However, specific conductance, hardness, chlorides, and metals concentrations were elevated as compared to ADEM's reference reach data collected in the Dissected Plateau ecoregion.

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Table 5. Summary of water quality data collected March-October, 2007. 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
Physical									
Temperature (°C)	8		13.7		23.2	17.6	18.6	3.6	
Turbidity (NTU)	8		4.5		58.1	7.5	13.8	18.1	
Total Dissolved Solids (mg/L)	8		22.0		62.0	45.0	45.6	13.3	
Total Suspended Solids (mg/L)	8		2.0		32.0	6.0	10.5	10.7	
Specific Conductance (µmhos)	8		41.4		71.8	52.8 G	55.6	11.2	
Hardness (mg/L)	4		13.8		23.2	19.0 G	18.8	3.9	
Alkalinity (mg/L)	8		11.2		41.0	23.1	23.1	9.0	
Stream Flow (cfs)	7		2.0		29.8	9.6	11.6	10.3	
Chemical									
Dissolved Oxygen (mg/L)	8		7.0		9.5	8.4	8.2	0.9	
pH (su)	8		6.7		7.1	6.9	6.9	0.1	
Ammonia Nitrogen (mg/L)	8	<	0.015		0.044	0.008	0.014	0.014	
Nitrate+Nitrite Nitrogen (mg/L)	8		0.098		0.281	0.208	0.206	0.058	
Total Kjeldahl Nitrogen (mg/L)	8	<	0.150		0.366	0.161	0.189	0.126	
Total Nitrogen (mg/L)	8	<	0.260		0.629	0.381	0.395	0.119	
Dissolved Reactive Phosphorus (mg/L)	8		0.008		0.050	0.014	0.020	0.016	
J Total Phosphorus (mg/L)	8		0.016		0.040	0.024	0.025	0.008	
CBOD-5 (mg/L)	8	<	1.0		1.9	0.8	0.9	0.5	
J Chlorides (mg/L)	8		1.7		2.8	2.4 M	2.3	0.4	
Atrazine (µg/L)	2	<	0.05		0.06	0.04	0.04	0.02	
Total Metals									
J Aluminum (mg/L)	4	<	0.093		0.568	0.175	0.253	0.222	
Iron (mg/L)	4	<	0.005		1.880	1.130 M	1.036	0.784	
J Manganese (mg/L)	4	<	0.005		0.212	0.128 M	0.118	0.096	
Dissolved Metals									
Aluminum (mg/L)	4	<	0.015	<	0.500	0.068	0.098	0.113	
Antimony (µg/L)	4	<	1.6	<	7.5	1.0	1.6	1.4	
Arsenic (µg/L)	4	<	0.5	<	5.0	1.1	1.2	0.9	
Cadmium (mg/L)	4	<	0.001	<	0.005	0.001	0.001	0.001	
Chromium (mg/L)	4	<	0.002	<	0.005	0.002	0.002	0.001	
Copper (mg/L)	4	<	0.002		0.009 S	0.002	0.004	0.004	1
J Iron (mg/L)	4		0.210		0.705	0.413	0.435	0.236	
Lead (µg/L)	4	<	1.1	<	5.0	0.7	1.1	0.9	
J Manganese (mg/L)	4		0.043		0.204	0.085 M	0.104	0.070	
J Mercury (µg/L)	4	<	0.03	<	0.5	0.2	0.2	0.1	
J Nickel (mg/L)	4	<	0.005	<	0.007	0.003	0.004	0.002	
Selenium (µg/L)	4	<	1.6	<	7.5	0.8	1.5	1.5	
Silver (mg/L)	4	<	0.001	<	0.003	0.001	0.001	0.001	
Thallium (µg/L)	4	<	0.6	<	9.0	0.4	1.4	2.0	
Zinc (mg/L)	3	<	0.002	<	0.006	0.003	0.002	0.001	
Biological									
J Chlorophyll a (ug/L)	8	<	0.10		5.34	2.40	2.21	2.05	
J Fecal Coliform (col/100 mL)	8		83		1700	210	433	543	

E=# of samples that exceeded criteria; G=value higher than median concentration of all verified ecoregional reference reach data collected in the ecoregion 68e; J=estimate; M=value > 90% of all data collected within ecoregion 68e ; N=# samples; S=F&W hardness-adjusted aquatic life use criteria exceeded.