Rivers and Streams Monitoring Program

ADEM
Alabama Department of Environmental Management

Ecological Reference Reach

2008 Monitoring Summary

™

Poor

Clear Creek at Swimming Hole Road (31.12152/-86.37575)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) has been monitoring Clear Creek in conjunction with its Ecoregional Reference Site Program since 1992. Additionally, ADEM included the Clear Creek watershed for biological and water quality monitoring as part of the 2008 Assessment of the Southeast Alabama (SE AL) River Basins. The objectives of the SE AL Basin Assessments were to assess the biological integrity of each monitoring site and to estimate overall water quality within the SE AL basin group.
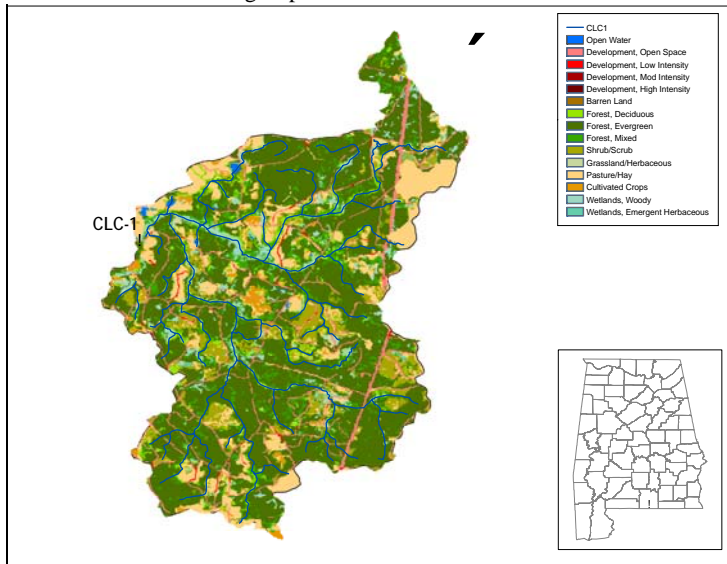

Figure 1. Sampling location and landuse within the Clear Creek watershed at CLC-1.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Clear Creek is a *Fish & Wildlife (F&W)* stream in southeast Covington County, bordered roughly by U.S. Highway 331 (east) and Alabama Highway 55 (west) (Figure 1). It is a tributary of the Yellow River. Based on the 2000 National Land Cover Dataset, land use within the watershed is primarily forest (67%) with some pasture/hay and shrub/scrub. As of February 23, 2011, ADEM has issued two 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. Clear Creek at CLC-1 is a low gradient glide-pool stream. Instream substrates are dominated by sand. The overall habitat assessment resulted in a *sub-optimal* rating. However, poor instream habitat quality, a relatively straight channel, and unstable banks were noted as concerns.

BIOASSESSMENT RESULTS

Benthic macroinvertebrate communities were sampled using ADEM's Intensive Multi-habitat Bioassessment methodology (WMB-I). Table 4 summarizes results of taxonomic richness, community composition, and community tolerance metrics. Each metric is scored on a 100 point scale. The final score is the average of all metric scores. Metric results indicated the macroinvertebrate community in Clear Creek at CLC-1 to be in *poor* condition. This indicates a change from previous assessments. Between 1992 and 2004, macroinvertebrate assessments have been conducted at Clear Creek at CLC-1 six times. All assessments resulted in *good* ratings.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Perdido-Escambia River
Drainage Area (mi^2)		40
Ecoregion[a]		65g
% Landuse		
Open water		<1
Wetland	Woody	5
	Emergent herbaceous	<1
Forest	Deciduous	3
	Evergreen	54
	Mixed	10
Shrub/scrub		9
Grassland/herbaceous		<1
Pasture/hay		10
Cultivated crops		1
Development	Open space	6
	Low intensity	<1
Population/km^{2}[b]		1
# NPDES Permits[c]	**TOTAL**	2
Construction Stormwater		2

a. Dougherty Plain
b. 2000 US Census
c. #NPDES permits downloaded from ADEM's NPDES Management System database, February 23, 2011.

Table 2. Physical characteristics of Clear Creek at CLC-1,

Physical Characteristics		
Width (ft)		20
Canopy Cover		Shaded
Depth (ft)		
	Run	1.5
	Pool	2.5
% of Reach		
	Run	50
	Pool	50
% Substrate		
	Sand	80
	Silt	5
	Organic Matter	15

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Table 3. Results of the habitat assessment conducted in Clear Creek at CLC-1, May 21, 2008.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	38	Poor <40
Sediment Deposition	66	Optimal >65
Sinuosity	55	Marginal (45-64)
Bank and Vegetative Stability	40	Marginal (35-59)
Riparian Buffer	88	Sub-optimal (70-89)
Habitat Assessment Score	**124**	
% Maximum Score	**56**	**Sub-optimal (53-65)**

Table 4. Results of the macroinvertebrate bioassessment conducted in Clear Creek at CLC-1, May 21, 2008.

Macroinvertebrate Assessment			
	Results	Scores	Rating
Taxa richness measures			
# EPT genera	15	60	Good (57-78)
Taxonomic composition measures			
% Non-insect taxa	18	34	Poor (30.9-61.8)
% Plecoptera	3	14	Good (5.7-52.8)
% Dominant taxa	42	21	Very Poor (<23.5)
Functional composition measures			
% Predators	11	37	Fair (30.2-45.2)
Tolerance measures			
Beck's community tolerance index	14	64	Good (31.9-65.9)
% Nutrient tolerant organisms	59	18	Very Poor (<25.4)
WMB-I Assessment Score	--	**35**	**Poor (19-37)**

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. In situ measurements and water samples were collected July, September, and November 2008 to help identify any stressors to the biological communities. In situ parameters were also measured during the macroinvertebrate assessment. Clear Creek met *F&W* use classification criteria for temperature, turbidity, dissolved oxygen and pathogens. In stream pH measurements were higher than expected for the ecoregion, as were hardness, alkalinity, and specific conductivity. Organics samples were less than MDL, as were dissolved metals except for iron, manganese and nickel. No toxicities were detected.

SUMMARY

Clear Creek at CLC-1 is typical of other streams in the Dougherty Plain ecoregion. Generally, they are low-gradient, sand-bottomed streams. Overall habitat was rated *sub-optimal,* however, instream habitat quality, sinuosity and bank and vegetative stability concerns were noted. Three of the four lowest flows ever measured in Clear Creek occurred in 2008.

Instream habitat has declined since 2004. Whereas, water quality results indicated no significant changes since 2004. Changes in habitat quality, caused by low water levels, are impacting macroinvertebrate communities in Clear Creek.

Table 5. Summary of water quality data collected during 2008. 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	Q
Physical							
Temperature (°C)	4	10.2	23.0	22.2	19.4	6.1	
Turbidity (NTU)	4	1.5	4.9	2.8	3.0	1.5	
Total Dissolved Solids (mg/L)	3	42.0	106.0	66.0	71.3	32.3	
Total Suspended Solids (mg/L)	3	< 1.0	6.0	2.0	2.8	2.8	
Specific Conductance (µmhos)	4	138.7	174.7	164.6 G	160.6	15.4	
Hardness (mg/L)	3	65.5	86.9	71.4 G	74.6	11.0	
Alkalinity (mg/L)	3	64.8	83.5	75.8 M	74.7	9.4	
Stream Flow (cfs)	4	6.7	15.2	8.5	9.7	3.8	
Chemical							
Dissolved Oxygen (mg/L)	4	7.3	10.0	7.4	8.0	1.4	
pH (su)	4	7.1	7.8	7.4 M	7.4	0.3	
Ammonia Nitrogen (mg/L)	3	< 0.014	0.015	0.008	0.007	0.000	
Nitrate+Nitrite Nitrogen (mg/L)	3	0.013	0.079	0.051	0.048	0.033	
Total Kjeldahl Nitrogen (mg/L)	3	< 0.141	0.150	0.075	0.074	0.003	
Total Nitrogen (mg/L)	3	< 0.084	0.154	0.126	0.121	0.036	
Dissolved Reactive Phosphorus (mg/L)	3	0.010	0.015	0.014	0.013	0.003	
Total Phosphorus (mg/L)	3	0.022	0.026	0.023	0.024	0.002	
CBOD-5 (mg/L)	3	< 1.0	2.9	0.5	1.3	1.4	
COD (mg/L)	3	< 2.0	17.5	14.3	10.9	8.8	
Chlorides (mg/L)	3	2.2	2.6	2.5	2.5	0.2	
Atrazine (µg/L)	2	< 0.05	< 0.05	0.02	0.02	0.00	
Total Metals							
Aluminum (mg/L)	3	0.034	0.116	0.079	0.076	0.041	J
Iron (mg/L)	3	0.067	0.298	0.229	0.198	0.119	J
Manganese (mg/L)	3	0.032	0.048	0.043	0.041	0.008	J
Dissolved Metals							
Aluminum (mg/L)	3	< 0.015	< 0.019	0.010	0.009	0.001	
Antimony (µg/L)	3	< 2.0	< 2.0	1.0	1.0	0.0	
Arsenic (µg/L)	3	< 1.6	< 2.2	1.1	1.0	0.2	
Cadmium (mg/L)	3	< 0.003	< 0.005	0.002	0.002	0.001	
Chromium (mg/L)	3	< 0.004	< 0.013	0.006	0.005	0.003	
Copper (mg/L)	3	< 0.005	< 0.013	0.006	0.005	0.002	
Iron (mg/L)	3	0.037	0.144	0.113	0.098	0.055	J
Lead (µg/L)	3	< 0.6	< 1.5	0.7	0.6	0.3	
Manganese (mg/L)	3	0.031	0.038	0.036	0.035	0.004	J
Mercury (µg/L)	3	< 0.0	< 0.1	0.0	0.0	0.0	
Nickel (mg/L)	3	< 0.004	0.014	0.003	0.006	0.007	J
Selenium (µg/L)	3	< 1.5	< 1.6	0.8	0.8	0.0	
Silver (mg/L)	3	< 0.002	< 0.003	0.001	0.001	0.000	
Thallium (µg/L)	3	< 0.5	< 0.6	0.3	0.3	0.0	
Zinc (mg/L)	3	< 0.003	< 0.006	0.003	0.002	0.001	J
Biological							
Chlorophyll a (ug/L)	3	< 0.10	0.53	0.27	0.28	0.24	
Fecal Coliform (col/100 mL)	3	20	280	68	123	138	J

G=value greater than median concentration of all verified reference data collected in ecoregion 65g; J=estimate; M=value>90% of all verified ecoregional reference reach data collected in ecoregion 65g; N=# of samples; Q=Laboratory Qualifier Codes;