

2008 Monitoring Summary



Halawakee Creek at Lee County Road 390 (32.69632 / -85.25603)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Halawakee Creek watershed for biological and water quality monitoring as part of the 2008 Assessment of the Southeast Alabama River Basin (SE AL). The objectives of this project were to assess the biological integrity of each monitoring site and estimate overall water quality within the basin.



Figure 1. Sampling location within the Halawakee Creek watershed at HACL-1.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Halawakee Creek at HACL-1 is a *Fish & Wildlife (F&W)* stream located in the Chattahoochee River basin. Based on the 2000 National Land Cover Dataset, landuse within the watershed is primarily forest (53%) and pastureland. As of February 23, 2011, ADEM has issued a total of 78 NPDES permits within the watershed (Table 1).

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. Halawakee Creek is a high-gradient, riffle-run stream characterized by sand substrates typical of the Southern Outer Piedmont ecoregion (Figure 1). When assessed in 1999, the substrate consisted of an even mix of bedrock, gravel, sand, and cobble substrate, with sand comprising only one-fourth of the stream bed. The reach was mostly-shaded and had a greater overall depth. The habitat assessment was rated as *excellent*.

The 2008 assessment indicated a significant change in stream composition and habitat availability. The overall depth decreased and the severe sediment deposition, weak bank and vegetative stability, and deterioration of riparian buffer zones lowered the assessment rating to *marginal*. Images from Google Earth show new housing developments upstream of where this assessment was conducted.

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. In 1999, the condition of the biological community was rated as *poor*, with a total of 9 EPT families having been identified. The 2008 assessment identified 14 EPT families. Despite the increase, however, the final score still indicated the biological community to be in *poor* condition (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		Chattahoochee River
Basin		Chattahoochee River
Drainage Area (mi²)		43
Ecoregion^a		45b
% Landuse		
Open water		<1
Wetland	Woody	4
Forest	Deciduous	27
	Evergreen	25
	Mixed	1
Shrub/scrub		2
Grassland/herbaceous		8
Pasture/hay		26
Cultivated crops		<1
Development	Open space	4
	Low intensity	2
	Moderate intensity	<1
	High intensity	<1
Barren		1
Population/km^{2b}		23
# NPDES Permits^c	TOTAL	78
	401 Water Quality Certification	3
	Construction Stormwater	67
	Mining	1
	Industrial General	7

a.Southern Outer Piedmont

b.2000 US Census

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

Table 2. Physical characteristics of Halawakee Creek at HACL-1, June 10, 2008.

Physical Characteristics		
Width (ft)	45	
Canopy Cover	Estimate 50/50	
Depth (ft)		
	Riffle	0.5
	Run	1.0
	Pool	1.5
% of Reach		
	Riffle	10
	Run	70
	Pool	20
% Substrate		
	Boulder	2
	Clay	3
	Cobble	5
	Gravel	15
	Sand	70
	Silt	2
	Organic Matter	3

Table 3. Results of the habitat assessment conducted in Halawakee Creek at HACL-1, June 10, 2008.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	61	Sub-optimal (59-70)
Sediment Deposition	49	Marginal (41-58)
Sinuosity	78	Sub-optimal (65-84)
Bank and Vegetative Stability	40	Marginal (35-59)
Riparian Buffer	65	Marginal (50-69)
Habitat Assessment Score	137	
% Maximum Score	57	Marginal (41-58)

Table 4. Results of the macroinvertebrate assessment conducted in Halawakee Creek at HACL-1, June 10, 2008.

Macroinvertebrate Assessment				
Taxa richness measures	Results (0-100)			
# Ephemeroptera (mayfly) genera	10	83	Good (75-85)	
# Plecoptera (stonefly) genera	1	17	Poor (16-31)	
# Trichoptera (caddisfly) genera	10	83	Excellent (>83)	
Taxonomic composition measures				
% Non-insect taxa	13	47	Poor (24.7-49.4)	
% Non-insect organisms	19	49	Poor (31.3-62.7)	
% Plecoptera	1	3	Very Poor (<6.56)	
Tolerance measures				
Beck's community tolerance index	13	46	Fair (41.0-60.9)	
WMB-I Assessment Score	--	47	Poor (24-48)	

WATER CHEMISTRY RESULTS

Results of water chemistry are presented in Table 5. In situ measurements and water samples were collected in June, August, and October of 2008 to help identify any stressors to the biological communities. In situ measurements indicated median specific conductivity and turbidity were higher than reference reach data collected in ecoregion 45. Total aluminum, iron, and manganese concentrations were higher than expected for the Piedmont ecoregion. Dissolved iron and manganese were also greater than expected. Dissolved silver exceeded *F&W* Aquatic Life Use criteria for hardness adjusted metals one time in October.

SUMMARY

The habitat assessment and water quality data suggest the reach to be impacted by sediment deposition from urban development. The increase in EPT families collected is a positive sign, but the decline of instream habitat is a concern.

Table 5. Summary of water quality data collected June, August, and October, 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	E
Physical								
Temperature (°C)	4	16.8	26.9	24.6	23.2	4.7		
Turbidity (NTU)	4	6.9	162.0 ^T	16.6	50.5	74.6		
Total Dissolved Solids (mg/L)	3	30.0	94.0	36.0	53.3	35.4		
Total Suspended Solids (mg/L)	3	< 1.0	70.0	0.5	23.7	40.1		
Specific Conductance (µmhos)	4	39.6	63.2	61.6 ^G	56.5	11.3		
Hardness (mg/L)	3	5.8	19.6	9.9	11.8	7.1		
Alkalinity (mg/L)	3	12.2	28.1	17.5	19.3	8.1		
Stream Flow (cfs)	4	4.1	23.9	4.7	9.4	9.7		
Chemical								
Dissolved Oxygen (mg/L)	4	7.1	8.1	7.5	7.5	0.4		
pH (su)	4	6.7	7.0	6.9	6.9	0.1		
Ammonia Nitrogen (mg/L)	3	< 0.015	0.019	0.008	0.011	0.007		
Nitrate+Nitrite Nitrogen (mg/L)	3	< 0.003	0.388	0.082	0.157	0.204		
Total Kjeldahl Nitrogen (mg/L)	3	< 0.150	0.480	0.075	0.210	0.234		
Total Nitrogen	3	< 0.076	0.868	0.157	0.367	0.436		
Dissolved Reactive Phosphorus (mg/L)	3	0.009	0.012	0.012	0.011	0.002		
Total Phosphorus (mg/L)	3	0.027	0.104	0.033	0.055	0.043		
CBOD-5 (mg/L)	3	< 1.0	1.0	0.5	0.5	0.0		
COD (mg/L)	3	< 2.0	19.3	8.0	9.4	9.2		
TOC (mg/L)	1				4.1			
Chlorides (mg/L)	3	1.8	2.7	2.4	2.3	0.5		
Atrazine (µg/L)	2	< 0.05	0.20	0.11	0.11	0.12		
Total Metals								
Aluminum (mg/L)	3	0.146	1.170	0.474 ^M	0.597	0.523 ^J		
Iron (mg/L)	3	0.835	2.440	1.380 ^M	1.552	0.816		
Manganese (mg/L)	3	0.096	0.344	0.170 ^M	0.203	0.127		
Dissolved Metals								
Aluminum (mg/L)	3	< 0.015	0.044	0.010	0.020	0.020		
Antimony (µg/L)	3	< 2.0	< 2.1	1.0	0.1	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	0.002	0.004	0.003		
Copper (mg/L)	3	< 0.005	< 0.013	0.002	0.004	0.002		
Iron (mg/L)	3	0.232	0.460	0.426 ^M	0.373	0.123		
Lead (µg/L)	3	< 0.6	< 1.5	0.7	0.6	0.3		
Manganese (mg/L)	3	0.085	0.137	0.132 ^M	0.118	0.029		
Mercury (µg/L)	3	< 0.0	< 0.0	0.0	0.0	0		
Nickel (mg/L)	3	< 0.004	< 0.006	0.003	0.003	0.001		
Selenium (µg/L)	3	< 1.5	< 1.6	0.8	0.8	0.0		
Silver (mg/L)	3	< 0.003	0.004 ^S	0.002	0.002	0.001 ^J		1
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		
Biological								
Chlorophyll a (ug/L)	3	0.10	5.34	0.53	1.97	2.92		
Fecal Coliform (col/100 mL)	3	70	>2,000	140	737	1,095 ^J		

E=# samples that exceeded criteria; G=value higher than median concentration of all verified ecoregional reference reach data collected in the ecoregion 45; J=estimate; M=value >90% of all verified ecoregional reference reach data collected in the ecoregion 45; N=# samples; S=*F&W* hardness-adjusted aquatic life use criteria exceeded; T=value exceeds 50 NTU above the 90th percentile of all verified ecoregional reference reach data collected in the ecoregion 45; Q=Laboratory qualifier codes

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