

2009 Monitoring Summary



Cypress Creek at Hodgesville Rd, Houston County (31.14730/-085.39107)

BACKGROUND

Since 1998, Cypress Creek, from Limestone Creek to its source (approximately 8 miles), has been on Alabama's Clean Water Act (CWA) §303(d) list of impaired waters for only partially meeting its *Fish and Wildlife (F&W)* water use classification. It was listed for impairments caused by nutrient and organic enrichment from municipal discharges and urban runoff/storm sewers. The segment was listed as impaired based on data collected in 1984 and 1986.

The Alabama Department of Environmental Management (ADEM) monitored Cypress Creek at CYC-2 to verify and document impairment from nutrients and organic enrichment at this site. A macroinvertebrate and habitat assessment were conducted to verify impairment to aquatic communities. Monthly water chemistry samples were collected to identify the causes of impairment. Results from these data may also be used in determination of Total Maximum Daily Load needs and priorities.



Figure 1. Photo of Cypress Creek at CYC-2, taken March 23, 2009.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Cypress Creek at CYC-2 is a *Fish & Wildlife (F&W)* stream located in Houston County, approximately two miles south of Dothan. Based on the 2000 National Land Cover Dataset, landuse within the watershed is development (31%), forest (26%), and cultivation. As of February 23, 2011, ADEM has issued 19 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. Cypress Creek at CYC-2 is a low-gradient sand-bottomed stream, typical of other streams within the Dougherty Plain ecoregion (Figure 1). Overall habitat quality was rated as *sub-optimal* due to marginal instream habitat quality and sinuosity, and weak bank and vegetative stability.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		Chipola River
Basin		Chipola River
Drainage Area (mi ²)		8
Ecoregion ^a		65g
% Landuse		
Open water		<1
Wetland	Woody	4
	Emergent herbaceous	<1
	Forest	
Forest	Deciduous	3
	Evergreen	21
	Mixed	2
Shrub/scrub		12
Grassland/herbaceous		<1
Pasture/hay		9
Cultivated crops		17
Development	Open space	14
	Low intensity	13
	Moderate intensity	3
	High intensity	1
Barren		
Population/km ^{2b}		328
# NPDES Permits ^c		TOTAL
Construction Stormwater		15
Industrial General		2
Municipal Individual		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 Cypress Creek at CYC-2, May 28, 2009.

Physical Characteristics		
Width (ft)	12	
Canopy Cover	Shaded	
Depth (ft)	Run	1.5
	Pool	3.0
% of Reach	Run	70
	Pool	30
% Substrate	Sand	84
	Silt	1
	Organic Matter	15

Table 3. Results of the habitat assessment conducted on Cypress Creek at CYC-2, May 28, 2009.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	43	Marginal (40-52)
Sediment Deposition	69	Optimal >65
Sinuosity	58	Marginal (45-64)
Bank and Vegetative Stability	54	Marginal (35-59)
Riparian Buffer	83	Sub-optimal (70-89)
Habitat Assessment Score	136	
% Maximum Score	62	Sub-optimal (53-65)

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 *very poor* condition (Table 4).

Table 4. Results of the macroinvertebrate bioassessment conducted at CYC-2, May 28, 2009.

Macroinvertebrate Assessment			
	Results	Scores	Rating
Taxa richness measures			
# EPT genera	3	12	Very Poor (<19)
Taxonomic composition measures			
% Non-insect taxa	23	8	Very Poor (<30.9)
% Plecoptera	0	0	Very Poor (<1.86)
% Dominant taxa	30	51	Fair (47.1-70.5)
Functional composition measures			
% Predators	1	2	Very Poor (<15.1)
Tolerance measures			
Beck's community tolerance index	1	5	Very Poor (<10.6)
% Nutrient tolerant organisms	72	0	Very Poor (<25.4)
WMB-I Assessment Score	--	11	Very Poor (<19)

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. When possible, in situ measurements and water samples were collected monthly from March through October 2009 to help identify potential stressors to the biological communities. In stream pH and dissolved oxygen concentrations exceeded criteria applicable to Cypress Creek's *F&W* use classification but were typical of other streams in ecoregion 65g. Median total dissolved solids, specific conductivity, alkalinity, dissolved reactive phosphorus, total phosphorus, and chlorophyll *a* values were higher than expected based on verified reference reach data collected in ecoregion 65g. Turbidity was greater than expected for ecoregion 65g on July 6th.

Table 5. Summary of water quality data collected March-October, 2009. 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)	9	13.3	25.4	23.8	21.8	4.2	
Turbidity (NTU)	9	5.8	138.0 ^T	11.0	24.4	42.7	
^J Total Dissolved Solids (mg/L)	8	76.0	120.0	102.0 ^M	100.5	13.4	
Total Suspended Solids (mg/L)	8	< 1.0	50.0	5.5	13.1	18.1	
Specific Conductance (µmhos)	9	78.1	141.1	107.8 ^G	107.2	19.2	
Alkalinity (mg/L)	8	20.7	59.5	40.1 ^M	40.9	12.3	
Stream Flow (cfs)	8	0.8	17.0	3.1	6.5	6.4	
Chemical							
Dissolved Oxygen (mg/L)	9	4.1 ^C	7.8	5.0	5.3	1.1	4
pH (su)	9	5.9 ^C	6.8	6.4	6.5	0.3	1
Ammonia Nitrogen (mg/L)	8	< 0.006	0.300	0.040 ^M	0.072	0.096	
^J Nitrate+Nitrite Nitrogen (mg/L)	8	0.007	0.425	0.107	0.185	0.180	
Total Kjeldahl Nitrogen (mg/L)	8	< 0.141	0.721	0.418	0.417	0.222	
^J Total Nitrogen (mg/L)	8	< 0.128	1.050	0.594	0.602	0.342	
Dissolved Reactive Phosphorus (mg/L)	8	0.018	0.038	0.029 ^M	0.029	0.006	
Total Phosphorus (mg/L)	8	0.073	0.286	0.121 ^M	0.139	0.067	
CBOD-5 (mg/L)	8	< 2.0	2.5	1.0	1.2	0.5	
Chlorides (mg/L)	8	3.2	6.6	5.6	5.4	1.0	
Biological							
Chlorophyll <i>a</i> (µg/L)	8	< 0.10	8.90	3.48 ^M	3.95	3.49	

C= *F&W* criteria violated; E=# samples that exceeded criteria; G=value higher than median concentration of all verified ecoregional reference reach data collected in the ecoregion 65g; J=estimate; M=value >90% of all verified ecoregional reference reach data collected in the ecoregion 65g; N=# samples; T=value exceeds 50 NTU above the 90th percentile of all verified ecoregional reference reach data collected in the ecoregion 65g.

SUMMARY

Elevated ammonia nitrogen, dissolved reactive phosphorus, and total phosphorus support the continued inclusion of Cypress Creek at CYC-2 on the CWA 303(d) list for nutrients. Low dissolved oxygen concentrations also justify continued inclusion on the CWA 303(d) list for low dissolved oxygen caused by organic enrichment. The TMDLs for these impairments are set to be drafted in 2015.

The habitat assessment indicated CYC-2 to be in *sub-optimal* condition due to limited instream habitat, channelization, and weak bank and vegetative stability. Macroinvertebrate sampling indicated the macroinvertebrate community to be in *very poor* condition due to a large number of nutrient-tolerant organisms. Based on these two assessments and the water chemistry results, it appears that the elevated nutrients, conductivity, and alkalinity concentrations are negatively impacting the stream.

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