Alabama Department of Environmental Management

303(d)/TMDL

Rivers and Streams Monitoring Program

2014 Monitoring Summary

Cypress Creek at WWTP access road (Houston County) (31.15870/-85.37730)

BACKGROUND

The 8.1 mile segment of Cypress Creek, from its confluence with the Limestone Creek upstream to its source, has been on Alabama's Clean Water Act (CWA) §303(d) list of impaired waters since 1998. It was listed for nutrients and organic enrichment (CBOD, NBOD) from municipal runoff/storm sewers. The Alabama Department of Environmental Management (ADEM) monitored Cypress Creek at CYC-4 in 2014 to investigate the extent of the impairment. Macroinvertebrate and habitat assessments were conducted at the site, and monthly water chemistry samples were also collected. These data will be used to develop Total Maximum Daily Loads (TMDLs), which are targeted for completion in 2016.

The Cypress Creek watershed was also selected for biological and water quality monitoring as part of the 2014 Southeastern Alabama (SE AL) River Basin Assessment Monitoring Program. The objectives of the SE AL River Basin Assessments were to assess the biological integrity of each monitoring site and to estimate overall water quality within the basin.

Figure 1. Cypress Creek at CYC-4, July 1, 2014.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Cypress Creek at CYC-4 is a *Fish & Wildlife* (*F&W*) stream located in Houston County. Based on the 2011 National Land Cover Dataset, land use within the watershed is predominantly development (38%), forest (26%), and cultivated crops. Population density is relatively high, with large portions of the upper catchment occupied by suburban residential development (Google Earth, accessed February 16, 2016). As of April 1, 2016 ADEM had issued nine NPDES permits within 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-4 is a low gradient, glide-pool stream located in the Dougherty Plain ecoregion (65g) (Figure 1). Benthic substrate consists primarily of sand, organic matter, and silt. Overall habitat quality was rated as *sub-optimal* for supporting the macroinvertebrate community.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Chipola R
Drainage Area (mi^2)		6
Ecoregion[a]		65G
% Landuse[b]		
Open water		<1
Wetland	Woody	4
	Emergent herbaceous	1
Forest	Deciduous	3
	Evergreen	20
	Mixed	3
Shrub/scrub		11
Grassland/herbaceous		1
Pasture/hay		7
Cultivated crops		13
Development	Open space	17
	Low intensity	16
	Moderate intensity	4
	High intensity	1
Population/km^2[c]		351
# NPDES Permits[d]	**TOTAL**	9
Construction		2
Industrial Individual		3
Underground Injection Control		4

a.Dougherty Plain

b.2011 National Land Cover Dataset

c.2010 US Census

d.#NPDES outfalls downloaded from ADEM's NPDES Management System database, April 1, 2016.

Table 2. Physical characteristics of Cypress Creek at CYC-4, July 1, 2014.

Physical Characteristics		
Width (ft)		8
Canopy Cover		Shaded
Depth (ft)		
	Run	1.0
	Pool	3.5
% of Reach		
	Run	60
	Pool	40
% Substrate		
	Sand	70
	Silt	10
	Organic Matter	20

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Table 3. Results of the habitat assessment conducted on Cypress Creek at CYC-4, July 1, 2014.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	54	Sub-optimal (53-65)
Sediment Deposition	73	Optimal (>65)
Sinuosity	75	Sub-optimal (65-84)
Bank and Vegetative Stability	21	Poor (<35)
Riparian Buffer	78	Sub-optimal (70-89)
Habitat Assessment Score	134	
% Maximum Score	61	Sub-optimal (53-65)

BIOASSESSMENT RESULTS

The benthic macroinvertebrate community was 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. The metric results indicated the macroinvertebrate community at CYC-4 to be in *poor* condition (Table 4), due in part to low diversity of sensitive insect taxa (i.e., EPT) along with a high percentage of nutrient tolerant individuals.

Table 4. Results of the macroinvertebrate bioassessment conducted in Cypress Creek at CYC-4, July 1, 2014.

Macroinvertebrate Assessment	
	Results
Taxa richness and diversity measures	
# EPT taxa	3
Taxonomic composition measures	
% Non-insect taxa	19
% Plecoptera	0
% Dominant taxon	28
Functional feeding group	
% Predators	15
Community tolerance	
Becks community tolerance index	2
% Nutrient tolerant individuals	48
WMB-I Assessment Score	28
WMB-I Assessment Rating	Poor (19-37)

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-October of 2014 to help identify any stressors to the biological community. On one sampling occasion (August 19), dissolved oxygen (DO) exceeded the minimum criterion applicable to *F&W* streams (i.e., <5.0 mg/L). This sample also coincided with the lowest recorded stream flow of the year (0.2 cfs). Also, no samples were taken during the September or October visits due to a lack of detectible flow. Median conductivity was higher than the median of all reference reach data for the Dougherty Plain ecoregion (65g). Also, median concentrations of alkalinity, ammonia nitrogen, nitrate+nitrite nitrogen, and total nitrogen were higher than expected based on the 90th percentile of reference reaches in this ecoregion.

Table 5. Summary of water quality data collected March-October 2014. 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)	7	14.3	24.8	22.9	20.5	4.3	
Turbidity (NTU)	11	4.2	36.2	9.8	12.4	9.5	
Total Dissolved Solids (mg/L)	6	56.0	100.0	85.5	81.7	18.2	
Total Suspended Solids (mg/L)	6 <	1.0	46.0	5.0	10.9	17.4	
Specific Conductance (µmhos)	7	97.6	161.2	127.4 G	130.6	33.8	
Alkalinity (mg/L)	6	33.1	87.2	47.3 M	55.4	22.6	
Stream Flow (cfs)	8	0.2	7.3	3.0	3.5	2.9	
Chemical							
Dissolved Oxygen (mg/L)	7	4.9 C	7.6	5.6	6.1	1.0	1
pH (su)	7	6.8	7.3	7.0	7.0	0.2	
J Ammonia Nitrogen (mg/L)	6 <	0.006	0.391	0.022 M	0.106	0.158	
Nitrate+Nitrite Nitrogen (mg/L)	6	0.280	0.589	0.351 M	0.376	0.112	
Total Kjeldahl Nitrogen (mg/L)	6	0.355	0.686	0.544	0.529	0.146	
Total Nitrogen (mg/L)	6	0.724	1.254	0.832 M	0.905	0.211	
J Dissolved Reactive Phosphorus (mg/L)	6	0.004	0.008	0.008	0.007	0.002	
Total Phosphorus (mg/L)	6	0.027	0.117	0.051	0.057	0.031	
J CBOD-5 (mg/L)	6 <	2.0 <	2.0	1.0	1.0	0.0	
Chlorides (mg/L)	6	4.1	5.7	4.8	4.9	0.5	

C= *F&W* criterion violated; E= # of samples that exceeded criteria; G= value > median of all ecoregional reference reach data collected in ecoregion 65g; J=estimate; M=value >90% of collected samples in ecoregion 65g; N= # samples.

SUMMARY

While habitat assessment results scored Cypress Creek at CYC-4 as *sub-optimal* for supporting the macroinvertebrate community, bioassessment results indicated the community to be in *poor* condition. Water chemistry analyses revealed a single violation of the *F&W* use classification criterion for DO in August, coinciding with low-flow conditions. Also, the absence of flow in September and October prevented sampling. Specific conductance, alkalinity, ammonia nitrogen, nitrate+nitrite nitrogen, and total nitrogen were higher than expected compared to data from ADEM's least-impaired reference reaches in the Dougherty Plain ecoregion. The data presented in this report and all other available data will be reviewed to identify the causes and sources of the degraded biological conditions.

FOR MORE INFORMATION, CONTACT:
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