

2012 Monitoring Summary



Cottondale Creek at Keenes Mill Road (Tuscaloosa County) (33.20056\ -87.44635)

BACKGROUND

Cottondale Creek is located in the Hurricane Creek watershed, and has experienced significant housing development over the last decade. The Alabama Department of Environmental Management (ADEM) selected Cottondale Branch watershed for biological and water quality monitoring in response to numerous complaints from stakeholders concerned about the impact of the development on conditions within Hurricane Creek.



Figure 1. Cottondale Creek at CTNT-1, May 1, 2012.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Cottondale Creek at CTNT-1 is a *Fish & Wildlife (F&W)* stream primarily located in the Fall Line Hills ecoregion (65i) in Tuscaloosa, Alabama (Tuscaloosa County). Based on the 2006 National Land Cover Dataset, land cover within the watershed is forest (48%) and development (23%). As of September 1, 2012, a total of 15 NPDES permit outfalls were located within the watershed, the vast majority of which are construction stormwater permits.

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. Cottondale Creek at CTNT-1 is a primarily bedrock bottomed stream, although some small cobble and gravel riffles were present (Figure 1). Overall habitat quality was categorized as *optimal* for supporting aquatic macroinvertebrate communities.

BIOASSESSMENT RESULTS

Benthic macroinvertebrate communities were sampled using ADEM's Intensive Multi-habitat Bioassessment methodology (WBM-I). The WBM-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 in Cottondale Creek at CTNT-1 to be characterized by non-insect taxa groups, indicating *fair* community condition (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		Black Warrior River
Basin		
Drainage Area (mi²)		16
Ecoregion^a		65i
% Landuse		
Open water		1
Wetland	Woody	5
Forest	Deciduous	31
	Evergreen	6
	Mixed	11
Shrub/scrub		15
Grassland/herbaceous		2
Pasture/hay		4
Cultivated crops		2
Development	Open space	13
	Low intensity	6
	Moderate intensity	3
	High intensity	1
Population/km^{2b}		143
# NPDES Permits^c	TOTAL	15
	Construction Stormwater	11
	Industrial General	4

a. Fall Line Hills

b. 2000 US Census

c. #NPDES permits downloaded from ADEM's NPDES Management System database, September 1, 2012.

Table 2. Physical characteristics of Cottondale Creek at CTNT-1, May 1, 2012.

Physical Characteristics	
Width (ft)	25
Canopy Cover	Mostly Shaded
Depth (ft)	
	Riffle 0.7
	Run 1.0
	Pool 2.0
% of Reach	
	Riffle 35
	Run 50
	Pool 15
% Substrate	
	Bedrock 60
	Boulder 1
	Cobble 2
	Gravel 5
	Sand 20
	Silt 5
	Organic Matter 7

Table 3. Results of the habitat assessment conducted on Cottondale Creek at CTNT-1, May 1, 2012.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	72	Optimal (>65)
Sediment Deposition	74	Optimal (>65)
Sinuosity	80	Sub-optimal (65-84)
Bank and Vegetative Stability	78	Optimal (>74)
Riparian Buffer	88	Sub-optimal (70-89)
Habitat Assessment Score	185	
% Maximum Score	77	Optimal (>65)

Table 4. Results of the macroinvertebrate bioassessment conducted in Cottondale Creek at CTNT-1, May 1, 2012.

Macroinvertebrate Assessment		
	Results	Scores
Taxa richness and diversity measures		(0-100)
% EPC taxa	18	13
% Dominant Taxon	29	50
Taxonomic composition measures		
% EPT minus Baetidae and Hydropsychidae	35	63
Functional feeding group		
# Collector Taxa	24	85
Community tolerance		
% Nutrient Tolerant individuals	55	16
WMB-I Assessment Score	---	46
WMB-I Assessment Rating		Fair (32-47)

WATER CHEMISTRY

Water chemistry analyses are presented in Table 5. In situ measurements and water samples were collected monthly during March through October of 2012 to help identify any stressors to the biological communities. Total dissolved arsenic exceeded human health criterion on May 8th, 2012. *E. coli* exceeded the human health criterion on August 9th 2012, following a thunderstorm with heavy rain. Alkalinity, chlorides, hardness, nitrate-nitrite nitrogen, total dissolved solids, and specific conductance had values greater than the 90th percentile of all verified reference reach data collected within this ecoregion.

SUMMARY

The Alabama Department of Environmental Management (ADEM) monitored Cottondale Branch at CTNT-1 in response to numerous complaints from stakeholders concerned about the impact of the development on conditions within Hurricane Creek.

Results of a habitat assessment conducted in May did not indicate sedimentation impacts. However, alkalinity, chlorides, hardness, nitrate-nitrite nitrogen, total dissolved solids, and specific conductance had values greater than the 90th percentile of all verified reference reach data collected within this ecoregion. Although samples of total dissolved arsenic did exceed human health criteria in Cottondale Creek, the ADEM criterion for arsenic are expressed as dissolved trivalent arsenic (arsenite-AS III). Presently studies are being conducted to provide a better understanding of the prevalence and areal distribution of dissolved trivalent arsenic to total arsenic in the State of Alabama. Upon conclusion of the studies Cottondale Creek will be reassessed for arsenic violations.

Table 5. Summary of water quality data collected March – October, 2012. Minimum (Min) and maximum (Max) values calculated using minimum detection limits (MDL). 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	Q
Physical								
Temperature (°C)	9	10.2	25.0	22.0	20.6	4.5		
Turbidity (NTU)	9	5.3	54.5	16.8	18.2	16.0		
Total Dissolved Solids (mg/L)	8	72.0	106.0	80.0	84.0	12.1		
Total Suspended Solids (mg/L)	8	< 1.0	18.0	4.0	5.8	5.7		
Specific Conductance (µmhos)	9	75.0	125.8	114.5	109.4	15.8		
Hardness (mg/L)	3	32.9	43.6	41.3	39.3	5.6		
Alkalinity (mg/L)	8	24.9	47.0	39.4	37.4	8.0		
Stream Flow (cfs)	8	1.2	12.8	2.5	4.3	3.9		
Chemical								
Dissolved Oxygen (mg/L)	9	7.3	10.3	8.6	8.6	0.9		
pH (su)	9	6.7	7.4	7.0	7.1	0.2		
Ammonia Nitrogen (mg/L)	8	< 0.007	0.040	0.004	0.008	0.013		
Nitrate+Nitrite Nitrogen (mg/L)	8	0.219	0.608	0.456	0.419	0.159		
Total Kjeldahl Nitrogen (mg/L)	8	< 0.041	0.640	0.233	0.242	0.215		
Total Nitrogen (mg/L)	8	0.275	0.921	0.669	0.662	0.225		
Dissolved Reactive Phosphorus (mg/L)	8	< 0.004	0.007	0.005	0.005	0.002		
Total Phosphorus (mg/L)	8	0.009	0.039	0.020	0.021	0.009		
CBOD-5 (mg/L)	8	< 2.0	2.7	1.0	1.2	0.6		
Chlorides (mg/L)	8	2.8	7.2	6.0	5.8	1.4		
Total Metals								
Aluminum (mg/L)	3	0.073	0.961	0.144	0.393	0.493		
Iron (mg/L)	3	0.564	1.650	0.929	1.048	0.553		
Manganese (mg/L)	3	0.045	0.203	0.092	0.113	0.081		
Dissolved Metals								
Aluminum (mg/L)	3	< 0.043	0.065	0.022	0.036	0.025		
Antimony (µg/L)	3	< 3.6	< 3.6	1.8	1.8	0.0		
Arsenic (µg/L)	3	< 1.8	2.1	0.9	1.3	0.7		1
Cadmium (µg/L)	3	< 0.022	< 0.046	0.023	0.019	0.007		
Chromium (µg/L)	3	< 9.000	< 9.000	4.500	4.500	0.000		
Copper (mg/L)	3	< 0.020	< 0.020	0.010	0.010	0.000		
Iron (mg/L)	3	0.185	0.379	0.228	0.264	0.102		
Lead (µg/L)	3	< 0.9	< 0.9	0.4	0.4	0.0		
Manganese (mg/L)	3	0.034	0.180	0.069	0.094	0.076		
Mercury (µg/L)	3	< 0.035	< 0.035	0.018	0.018	0.000		
Nickel (mg/L)	3	< 0.042	< 0.042	0.021	0.021	0.000		
Selenium (µg/L)	3	< 2.5	< 2.5	1.2	1.2	0.0		
Silver (µg/L)	3	< 0.015	< 0.215	0.108	0.074	0.058		
Thallium (µg/L)	3	< 1.4	< 1.4	0.7	0.7	0.0		
Zinc (mg/L)	3	< 0.012	< 0.012	0.006	0.006	0.000		
Biological								
<i>E. coli</i> (col/100mL)	8	88	2420	233	504	784	1	

J=estimate; N=# samples; M=value >90% of all data collected within ecoregion 65i; E=# samples that exceeded criteria; Q=uncertain exceedance; G=value higher than median concentration of all verified ecoregional reference reach data collected in ecoregion 65i; H=F&W Human Health criterion exceeded.

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