

2013 Monitoring Summary



Town Creek at Cutoff Road in between Morgan County Road 36 and AL Hwy 67(34.45904/-86.79898)

BACKGROUND

The 8.66 mile segment of Town Creek, from Cotaco Creek to its source, was placed on Alabama's 1998 Clean Water Act (CWA) §303(d) list of impaired waters for not meeting its *Fish & Wildlife (F&W)* water use classification criteria. It was listed for organic enrichment/low dissolved oxygen concentrations. The source of this impairment was listed as agriculture. A Total Maximum Daily Load (TMDL) to address this impairment was developed and approved by the USEPA, January 18, 2007.

A Watershed Management Plan (WMP) was developed to address sources of organic enrichment identified in the TMDL. The WMP was implemented August 6, 2009 through August 6, 2011, using a CWA §319(h) non-point source grant provided by USEPA through the Alabama Department of Environmental Management (ADEM) §319 Program.

In 2013, the ADEM conducted habitat and macroinvertebrate assessments and intensive water quality sampling of Town Creek at TWNM-1 to document current water quality conditions and to evaluate the effectiveness of best management practices (BMPs) implemented within the watershed.



Figure 1. Town Creek at TWNM-1, June 13, 2013.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Town Creek is located in the Eastern Highland Rim ecoregion (71g). At this location, Town Creek drains twenty one square miles in Morgan County. Based on the 2011 National Land Cover Dataset, landuse within the watershed is primarily pasture/hay followed by forest (34%), shrub/scrub and agricultural crops. Population density is relatively low.

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.

Town Creek at TWNM-1 is a riffle-run stream with gravel, bedrock, cobble, boulder, sand, and silt substrates (Figure 1). Overall habitat quality was categorized as *optimal* due to the habitat created by riffles, snags, leaf packs and root banks within the reach.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		Tennessee River
Basin		
Drainage Area (mi²)		21
Ecoregion^a		71g
% Landuse		
Open water		<1
Wetland	Woody	<1
	Emergent herbaceous	<1
Forest	Deciduous	25
	Evergreen	5
	Mixed	4
Shrub/scrub		8
Grassland/herbaceous		1
Pasture/hay		45
Cultivated crops		6
Development	Open space	4
	Low intensity	1
	Moderate intensity	<1
	High intensity	<1
Barren		<1
Population/km^{2b}		49

a. Eastern Highland Rim

b. 2000 US Census

Table 2. Physical characteristics of Town Creek at TWNM-1, June 13, 2013.

Physical Characteristics	
Canopy Cover	Mostly Shaded
Width (ft)	30
Depth (ft)	
	Riffle 0.3
	Run 1.0
% of Reach	
	Riffle 90
	Run 10
% Substrate	
	Bedrock 20
	Boulder 10
	Cobble 10
	Gravel 45
	Sand 10
	Silt 2
	Organic Matter 3

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 in comparison to conditions expected in north Alabama streams and rivers. Each score is based on a six-point scale, ranging from 1, or *natural*, to 6 or *highly altered*. The final score is the average of all individual metric scores. The macroinvertebrate survey conducted in Town Creek at TWNM-1 to be in *fair* condition (Table 4).

Table 3. Results of the habitat assessment conducted on Town Creek at TWNM-1, June 13, 2013.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	83	Optimal >70
Sediment Deposition	83	Optimal >70
Sinuosity	95	Optimal >84
Bank and Vegetative Stability	61	Sub-optimal (60-74)
Riparian Buffer	73	Optimal >89
Habitat Assessment Score	156	
% Maximum Score	83	Optimal >70

Table 4. Results of the macroinvertebrate bioassessment conducted in Town Creek at TWNM-1, June 13, 2013.

Macroinvertebrate Assessment		Results
Taxa richness and diversity measures		
	Total # Taxa	51
	# EPT taxa	10
	Shannon Diversity	3.95
	# Highly-sensitive and Specialized Taxa	4
Taxonomic composition measures		
	% EPT minus Baetidae and Hydropsychidae	4
	% Non-insect taxa	22
	% Individuals in Dominant 5 Taxa	14
Functional feeding group		
	% Predator Individuals	4
Community tolerance		
	# Sensitive EPT	6
	% Sensitive taxa	16
	% Tolerant taxa	26
	WMB-I Assessment Score	4
	WMB-I Assessment Rating	Fair

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. *In situ* measurements and water samples were collected April, June, August, and October, 2013, to help identify any stressors to the biological communities. Dissolved oxygen concentrations ranged between 7.0-7.9 mg/L. However, median concentrations of specific conductivity and hardness were higher than expected based on the median concentration of all verified reference reach data collected in ecoregion 71. Median concentrations of total dissolved solids, alkalinity, dissolved reactive phosphorus, chlorides, total metals (aluminum and manganese), and dissolved metals (aluminum and iron) were also higher than expected. Arsenic exceeded human health criteria for water and fish consumption in April.

SUMMARY

As part of the assessment process, ADEM will review the monitoring information presented in this report along with all other available data. Bioassessment results indicated the macroinvertebrate community to be in *fair* condition. Habitat quality and availability was assessed as *optimal* for supporting macroinvertebrate communities. Specific conductance, hardness, total dissolved solids, alkalinity, chlorides, and arsenic were higher than expected for this ecoregion. Monitoring should continue to ensure that water quality and biological conditions remain stable.

Table 5. Summary of water quality data collected April-October, 2013. 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)	4	18.7	23.0	21.0	20.9	2.3		
Turbidity (NTU)	5	2.2	11.3	5.9	6.4	4.2		
Total Dissolved Solids (mg/L)	4	147.0	230.0	180.5 ^M	184.5	35.1		
Total Suspended Solids (mg/L)	4	< 1.0	8.0	2.5	3.4	3.2		
Specific Conductance (µmhos)	4	202.9	395.3	308.4 ^G	303.8	80.7		
Hardness (mg/L)	4	85.4	206.0	139.5 ^G	142.6	52.7		
Alkalinity (mg/L)	4	83.8	204.0	138.0 ^M	141.0	54.2		
Stream Flow (cfs)	4	1.3	13.9	7.1	7.4	5.2		
Chemical								
Dissolved Oxygen (mg/L)	4	7.0	7.9	7.7	7.6	0.4		
pH (su)	4	7.6	7.9	7.7	7.7	0.1		
Ammonia Nitrogen (mg/L)	4	< 0.004	0.018	0.006	0.006	0.004		
¹ Nitrate+Nitrite Nitrogen (mg/L)	4	0.011	1.525	0.150	0.459	0.714		
¹ Total Kjeldahl Nitrogen (mg/L)	4	0.361	1.100	0.405	0.568	0.356		
¹ Total Nitrogen (mg/L)	4	0.396	2.625	0.544	1.027	1.068		
¹ Dissolved Reactive Phosphorus (mg/L)	4	0.006	0.116	0.020 ^M	0.041	0.051		
Total Phosphorus (mg/L)	4	0.017	0.159	0.040	0.064	0.065		
CBOD-5 (mg/L)	4	< 2.0	< 2.0	1.0	1.0	0.0		
Chlorides (mg/L)	4	2.9	3.8	3.7 ^M	3.5	0.4		
¹ Atrazine (µg/L)	1				0.08			
Total Metals								
Aluminum (mg/L)	4	< 0.076	0.436	0.326 ^M	0.282	0.193		
¹ Iron (mg/L)	4	0.095	0.593	0.351	0.348	0.229		
¹ Manganese (mg/L)	4	0.025	0.071	0.040 ^M	0.044	0.021		
Dissolved Metals								
Aluminum (mg/L)	4	< 0.076	0.207	0.120 ^M	0.121	0.096		
Antimony (µg/L)	4	< 0.1	2.6	0.0	0.4	0.6		
¹ Arsenic (µg/L)	4	0.9 ^H	2.3 ^H	1.0	1.3	0.7	1	3
Cadmium (µg/L)	4	< 0.046	0.170	0.085	0.070	0.031		
¹ Chromium (mg/L)	4	< 0.001	0.032	0.001	0.005	0.007		3
Copper (mg/L)	1			<	0.031			
¹ Iron (mg/L)	4	< 0.018	0.344	0.144 ^M	0.160	0.159		
¹ Lead (µg/L)	4	< 0.1	1.1	0.2	0.2	0.2		
¹ Manganese (mg/L)	4	< 0.009	0.030	0.017	0.017	0.012		
Mercury (µg/L)	1	<		<	0.057			
¹ Nickel (mg/L)	4	< 0.000	0.016	0.001	0.002	0.004		
Selenium (µg/L)	4	< 0.2	1.4	0.1	0.3	0.3		
Silver (µg/L)	4	< 0.215	2.120	1.060	0.822	0.476		
Thallium (µg/L)	4	< 0.1	1.1	0.0	0.2	0.2		
¹ Zinc (mg/L)	4	< 0.002	0.017	0.003	0.004	0.003		
¹ Copper (mg/L)	3	0.001	0.002	0.001	0.001	0.001		
Biological								
Chlorophyll a (ug/L)	4	< 0.10	1.07	0.72	0.64	0.52		
E. coli (col/100mL)	4	135	816	526	501	324		

G=value > median concentration of all verified reference reach data collected in the ecoregion 71; H=F&W human health criterion exceeded; J=estimate; M=value > 90th percentile of all verified ecoregional reference reach data collected within ecoregions 71; N=# samples; Q= criterion exceedance uncertain.

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