Alabama Department of Environmental Management

303(d)/TMDL

Rivers and Streams Monitoring Program

2011 Monitoring Summary

Very Poor™

Toulmins Spring Branch at Craft Highway in Mobile County (30.72182/-88.08049)

BACKGROUND

The 3.22 mile segment of Toulmins Spring Branch from its mouth at Three Mile Creek to its source has been on Alabama's Clean Water Act (CWA) §303(d) list of impaired waters since 2004. It was listed for pathogens, based on fecal coliform samples collected by the United States Geological Survey (USGS) in 2000 and 2001. Subsequent data collected by the Alabama Department of Environmental Management (ADEM) in 2006 and 2007 confirmed impairment, and verified urban runoff and storm sewers as the sources of this impairment. Based on these data, Toulmins Spring Branch was listed for ammonia and nutrient impairment in 2008. The Total Maximum Daily Load (TMDL) for pathogens was completed and approved by the USEPA, September 23, 2009.

Sampling was conducted during 2011 to collect data for the development of the nutrient and ammonia TMDLs. A habitat and a macroinvertebrate assessment were conducted at Toulmins Spring Branch at TSBM-1 on August 31, 2011.

Figure 1. Toulmins Spring Branch at TSBM-1, August 31, 2011.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Toulmins Spring Branch at TSBM-1 is a *Fish & Wildlife (F&W)* stream located south of Prichard in Mobile County. Based on the 2011 National Land Cover Dataset, approximately 100% of the watershed is developed. Population density in the area is high. As of April 1, 2016, there were four NPDES outfalls active in the 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. Toulmins Spring Branch at TSBM-1 is a low gradient stream located in the Gulf Coast Flatwoods ecoregion (Figure 1). Substrate consists primarily of sand and cobble. Overall habitat quality was rated as *marginal* for supporting a diverse biological community due to lack of sinuosity, increased sedimentation, and limited riparian buffers.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Mobile R
Drainage Area (mi^2)		3
Ecoregion[a]		75A
% Landuse[b]		
Wetland	Woody	<1%
	Emergent herbaceous	<1%
Shrub/scrub		<1%
Development	Open space	43%
	Low intensity	42%
	Moderate intensity	12%
	High intensity	4%
Population/km^2[c]		1772
# NPDES Permits[d]	**TOTAL**	4
Construction		4

[a]·Gulf Coast Flatwoods

[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 Toulmins Spring Branch at TSBM-1, August 31, 2011.

Physical Characteristics		
Width (ft)		12
Canopy cover		Mostly Shaded
Depth (ft)		
	Run	2.5
	Pool	6
% of Reach		
	Run	10
	Pool	90
% Substrate		
	Boulder	1
	Clay	5
	Cobble	30
	Mud/Muck	10
	Gravel	3
	Sand	35
	Silt	10
	Organic Matter	6

BIOASSESSMENT RESULTS

Benthic macroinvertebrate communities were sampled using ADEM's Intensive Multi-habitat Bioassessment methodology (WMB-I). The WMB-I measures taxonomic richness, community composition, and community tolerance to assess the overall health of the macroinvertebrate community in comparison to conditions expected in Alabama's coastal plain streams and rivers. Each score is based on a six-point scale, ranging from 1, or *natural*, to 6, or *highly altered*. A total of 5,232 organisms in 22 distinct taxa were collected within the reach. These results indicate the community to be in *very poor* condition, characterized by extreme alterations in densities and taxa richness measures from levels expected in streams within this ecoregion (Table 4).

Table 3. Results of the habitat assessment conducted in Toulmins Spring Branch at TSBM-1, August 31, 2011.

Habitat Assessment	% Maximum Score	Rating
Instream Habitat Quality	58	Sub-Optimal (53-<65)
Sediment Deposition	46	Marginal (40-<53)
Sinuosity	15	Poor (<45)
Bank and Vegetative Stability	61	Sub-Optimal (60-<75)
Riparian Buffer	50	Marginal (60-<70)
Habitat Assessment Score	**100**	
% Maximum Score	**45**	**Marginal (40-<53)**

Table 4. Results of the macroinvertebrate bioassessment conducted in Toulmins Spring Branch at TSBM-1, August 31, 2011.

Macroinvertebrate Assessment	Results
Taxa richness and diversity measures	
# EPT taxa	2
Taxonomic composition measures	
% Non-insect taxa	27
% Plecoptera	0
% Dominant taxon	58
Functional feeding group	
% Predators	3
Community tolerance	
Becks community tolerance index	0
% Nutrient tolerant individuals	34
WMB-I Assessment Score	**11**
WMB-I Assessment Rating	**Very Poor (0-18)**

WATER CHEMISTRY

Results of water chemistry are presented in Table 5. In situ measurements and water samples were collected monthly, semi-monthly, or quarterly during March through October of 2011 to help identify any stressors to the biological community. Stream flow could only be measured twice during the sampling period due to stagnant water conditions. Dissolved oxygen (DO) concentrations ranged from 0.4-7.8 mg/L, with fourteen measurements below the *F&W* criterion of 5 mg/L. Mercury concentrations exceeded *F&W* use classification criterion and human health criteria on September 26, 2011. Stream pH was slightly below the *F&W* use classification criterion during the September sampling event. Atrazine was above the minimum detection limit in the May 12, 2011 sample.

SUMMARY

The condition of the macroinvertebrate community was rated as *very poor.* Overall habitat quality was *marginal* due to a lack of sinuosity, increased sedimentation, and limited riparian buffers. Dissolved oxygen concentrations were below the *F&W* criterion of 5 mg/L during fourteen sampling events. Low stream flow likely contributed to the low DO in the reach. Stream pH was slightly below the established *F&W* criterion of 6.0 in September. Dissolved mercury also exceeded *F&W* and human health criteria in the September sample.

Table 5. Summary of water quality data collected March-October, 2011. 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)	15		13.5		28.8	26.6	24.9	3.9	
Turbidity (NTU)	9		3.0		48.2	6.7	13.9	16.3	
Total Dissolved Solids (mg/L)	8		129.0		151.0	134.0	137.2	8.9	
Total Suspended Solids (mg/L)	8	<	5.0		24.0	5.5	9.6	8.2	
Specific Conductance (µmhos)	15		177.0		257.0	230.0	223.6	24.1	
Hardness (mg/L)	4		70.1		83.1	76.0	76.3	6.2	
Alkalinity (mg/L)	8		59.0		81.0	70.5	70.1	6.8	
Monthly Stream Flow (cfs)	9		0.1		4.2	0.1	0.7	1.4	
Stream Flow during Sample Collection (cfs)	2		1.7		4.2	3.0	3.0	1.8	
Chemical									
Dissolved Oxygen (mg/L)	15		0.4	C	7.8	1.7	2.1	1.8	14
pH (su)	15		5.7	C	6.9	6.2	6.2	0.3	1
J Ammonia Nitrogen (mg/L)	8		0.080		0.580	0.225	0.264	0.204	
J Nitrate+Nitrite Nitrogen (mg/L)	8	<	0.008		0.364	0.092	0.138	0.141	
J Total Kjeldahl Nitrogen (mg/L)	8		0.590		1.600	0.880	1.081	0.432	
J Total Nitrogen (mg/L)	8	<	0.723		1.964	1.052	1.199	0.474	
J Dissolved Reactive Phosphorus (mg/L)	8		0.008		0.098	0.018	0.028	0.030	
Total Phosphorus (mg/L)	8		0.085		0.420	0.160	0.191	0.120	
J CBOD-5 (mg/L)	8	<	1.0		4.1	1.9	2.2	1.2	
COD (mg/L)	4		32.0		290.0	53.0	107.0	123.0	
Chlorides (mg/L)	8		7.2		16.0	13.0	12.4	2.8	
Atrazine (µg/L)	2	<	0.02		0.05	0.03	0.03	0.03	
Total Metals									
J Aluminum (mg/L)	4		0.129		1.040	0.444	0.514	0.426	
J Iron (mg/L)	4		0.977		1.750	1.385	1.384	0.389	
Manganese (mg/L)	4		0.057		0.330	0.225	0.209	0.123	
Dissolved Metals									
J Aluminum (mg/L)	4	<	0.044		0.198	0.092	0.101	0.074	
J Antimony (µg/L)	4	<	2.3	<	2.3	1.2	1.2	0.0	
Arsenic (µg/L)	4	<	1.9	<	2.8	1.2	1.2	0.3	
J Cadmium (µg/L)	4		0.026	<	0.130	0.085	0.055	0.020	
J Chromium (µg/L)	4	<	6.000	<	6.000	3.000	3.000	0.000	
Copper (mg/L)	4	<	0.005	<	0.005	0.002	0.002	0.000	
J Iron (mg/L)	4		0.092		0.473	0.308	0.295	0.183	
J Lead (µg/L)	4	<	0.8	<	0.8	0.4	0.4	0.0	
J Manganese (mg/L)	4		0.054		0.322	0.202	0.195	0.116	
J Mercury (µg/L)	3	<	0.105		0.147	-H1	0.052	0.084	0.054	1
J Nickel (mg/L)	4	<	0.007	<	0.007	0.004	0.004	0.000	
J Selenium (µg/L)	4	<	0.8	<	0.8	0.4	0.4	0.0	
Silver (µg/L)	4	<	0.015	<	0.200	0.100	0.077	0.046	
Thallium (µg/L)	4	<	0.9	<	1.2	0.6	0.5	0.1	
J Zinc (mg/L)	4	<	0.032	<	0.032	0.016	0.016	0.000	
Biological									
Chlorophyll a (ug/L)	8	<	1.00		23.00	1.30	4.35	7.65	
E coli (col/100mL)	4		50		480	113	189	202	

A=*F&W* aquatic life use criterion exceeded; C=*F&W* criterion violated; E=# of samples that exceeded criteria; H=*F&W* human health criterion exceeded; J=estimate; N=# of samples.

FOR MORE INFORMATION, CONTACT:
Suzi Rice, ADEM Field Operations Division
2204 Perimeter Road, Mobile, AL 36615
(251) 450-3400 srice@adem.state.al.us