Rivers and Streams Monitoring Program

2012 Monitoring Summary

Alabama Department of Environmental Management

Basin Assessment Site

Fair™

Thompson Creek in Lawrence County at U.S.F.S. Road 208 (34.34100/-87.47120)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Thompson Creek watershed for biological and water quality monitoring as part of the 2012 Cahaba and Black Warrior (CBW) Basin Monitoring. Thompson Creek has been counted among the least disturbed watersheds in the Dissected Plateau ecoregion (68e) based on land use, road density, and population density; therefore, it has been selected as an ecological reference reach. The 2012 data will be used to assess the biological integrity of the site and estimate overall water quality within the Black Warrior River Basin. The data will also be used to evaluate the continued use of Thompson Creek as a "*best attainable*" condition reference watershed for comparison with other streams in this ecoregion.

Figure 1. Thompson Creek at TPSL-1, October 23, 2012.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Thompson Creek at TPSL-1 is a *Fish & Wildlife (F&W)* creek located within the Dissected Plateau ecoregion in Lawrence County. Based on the 2006 National Land Cover Dataset, land use within the watershed is composed primarily of deciduous forest (Figure 1). Population is low in the area, with little development. As of September 1, 2012, ADEM's NPDES Management System database does not show any permitted discharges within 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. Thompson Creek at TPSL-1 is a high-gradient stream. Instream substrates were dominated by cobble and gravel, with some organic matter. Habitat quality and availability within the reach were rated *optimal* for supporting macroinvertebrate communities.

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. The final score indicated the biological community at TPSL-1 to be in *fair* condition (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Black Warrior River
Drainage Area (mi^2)		15
Ecoregion[a]		68e
% Landuse		
Open water		<1
Wetland	Woody	<1
Forest	Deciduous	74
	Evergreen	11
	Mixed	13
Shrub/scrub		<1
Grassland/herbaceous		<1
Pasture/hay		<1
Development	Open space	1
	Moderate intensity	<1
Barren		<1
Population/km^2[b]		<1

a.Dissected Plateau

b.2000 US Census

Table 2. Physical characteristics of Thompson Creek at TPSL-1, May 16, 2012.

Physical Characteristics	
Width (ft)	18
Canopy Cover	Estimate 50/50
Depth (ft)	
Riffle	0.5
Run	1.5
Pool	4.0
% of Reach	
Riffle	10
Run	75
Pool	15
% Substrate	
Boulder	5
Cobble	30
Gravel	55
Sand	2
Silt	2
Organic Matter	6

Table 3. Results of the habitat assessment conducted on Thompson Creek at TPSL-1, May 16, 2012.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	84	Optimal (>70)
Sediment Deposition	78	Optimal (>70)
Sinuosity	83	Sub-optimal (65-84)
Bank and Vegetative Stability	61	Sub-optimal (60-74)
Riparian Buffer	95	Optimal (>89)
Habitat Assessment Score	**185**	
% Maximum Score	**77**	Optimal (>70)

Table 4. Results of the macroinvertebrate bioassessment conducted in Thompson Creek at TPSL-1, May 16, 2012.

Macroinvertebrate Assessment		
	Results	**Scores**
Taxa richness measures		**(0-100)**
# EPT taxa	20	70
Taxonomic composition measures		
% Non-insect taxa	12	53
% Dominant taxon	34	36
% EPC taxa	28	53
Functional feeding group measures		
% Predators	6	21
Tolerance measures		
% Taxa as Tolerant	30	55
WMB-I Assessment Score	**---**	**48**
WMB-I Assessment Rating		**Fair (39-58)**

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. In situ measurements and water samples were collected monthly and semi-monthly (metals) during April through November of 2012 to help identify any stressors to the biological communities.

In situ parameters suggest that Thompson Creek at TPSL-1 is meeting water quality criteria for its *F & W* use classification. On several occasions, however, specific conductance and hardness were higher than the median concentration of all verified reference reach data for this ecoregion, and chlorides and copper were higher than expected based on the 90th percentile of all samples collected at reference reaches in the Dissected Plateau ecoregion (68e).

SUMMARY

ADEM monitored Thompson Creek as part of the Basin Assessment and as a "best attainable" condition reference reach watershed for the Black Warrior River in 2012. Bioassessment results indicated the macroinvertebrate community to be in *fair* condition, though overall habitat quality was categorized as *optimal*. Specific conductance, hardness, chlorides, and copper were greater than expected for this ecoregion.

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Table 5. Summary of water quality data collected April-November, 2012. 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
	Physical									
	Temperature (°C)	9		9.5		23.9	19.0		18.1	4.2
	Turbidity (NTU)	9		1.3		6.2	1.8		2.2	1.5
J	Total Dissolved Solids (mg/L)	7		58.0		1420.0	82.0		268.3	508.0
J	Total Suspended Solids (mg/L)	7	<	1.0		13.0	0.5		2.8	4.6
	Specific Conductance (µmhos)	9		90.0		149.0	107.0	G	116.9	22.7
	Hardness (mg/L)	3		39.4		59.1	44.9	G	47.8	10.2
	Alkalinity (mg/L)	7		14.5		1263.0	37.1		206.0	466.2
	Stream Flow (cfs)	9		0.5		9.3	2.7		2.8	2.7
	Chemical									
	Dissolved Oxygen (mg/L)	9		8.1		10.6	8.7		8.9	0.8
	pH (su)	9		7.1		7.9	7.7		7.6	0.2
J	Ammonia Nitrogen (mg/L)	7	<	0.010		0.098	0.014		0.023	0.033
J	Nitrate+Nitrite Nitrogen (mg/L)	7	<	0.006		0.113	0.046		0.049	0.042
J	Total Kjeldahl Nitrogen (mg/L)	7	<	0.040		0.210	0.098		0.116	0.079
J	Total Nitrogen (mg/L)	7	<	0.073		0.323	0.132		0.165	0.088
J	Dissolved Reactive Phosphorus (mg/L)	7	<	0.004		0.011	0.005		0.006	0.003
J	Total Phosphorus (mg/L)	7	<	0.006		0.018	0.006		0.008	0.005
J	CBOD-5 (mg/L)	7	<	1.0		2.0	1.0		0.9	0.2
J	TOC (mg/L)	5		0.9		1.8	1.1		1.3	0.4
J	Chlorides (mg/L)	6	<	1.0		6.5	1.3	M	2.0	2.2
	Total Metals									
J	Aluminum (mg/L)	3	<	0.030		0.059	0.053		0.042	0.024
J	Iron (mg/L)	3	<	0.100		0.137	0.103		0.097	0.044
J	Manganese (mg/L)	3		0.011		0.022	0.012		0.015	0.006
	Dissolved Metals									
	Aluminum (mg/L)	3	<	0.030	<	0.030	0.015		0.015	0.000
J	Antimony (µg/L)	3	<	0.8	<	0.8	0.4		0.4	0.0
J	Arsenic (µg/L)	3	<	1.0	<	1.0	0.5		0.5	0.0
J	Cadmium (µg/L)	3	<	0.090		0.135	0.045		0.075	0.052
	Chromium (mg/L)	3	<	0.005	<	0.005	0.002		0.002	0.000
	Copper (mg/L)	3	<	0.100		0.300	0.150	M	0.117	0.058
J	Iron (mg/L)	3	<	0.100		0.111	0.050		0.070	0.035
	Lead (µg/L)	3	<	1.6	<	1.6	0.8		0.8	0.0
J	Manganese (mg/L)	3		0.006		0.015	0.010		0.010	0.004
	Nickel (mg/L)	3	<	0.010	<	0.010	0.005		0.005	0.000
	Selenium (µg/L)	3	<	2.0	<	2.0	1.0		1.0	0.0
	Silver (µg/L)	3	<	1.000	<	1.000	0.500		0.500	0.000
	Thallium (µg/L)	3	<	0.4	<	0.4	0.2		0.2	0.0
	Zinc (mg/L)	3	<	0.009		0.020	0.010		0.008	0.003
	Biological									
J	Chlorophyll a (ug/L)	7	<	1.00	<	1.00	0.50		0.50	0.00
J	E. coli (col/100mL)	7		13		99	40		46	29

G=value higher than median concentration of all verified ecoregional reference reach data collected in the ecoregion 68e; J=estimate; M=value >90% of all verified ecoregional reference reach data collected in the ecoregion 68e; N=# samples.