ADEM
Alabama Department of Environmental Management
Basin Assessment Site

2009 Monitoring Summary

Good

Mill Branch at Franklin County Road 11 (34.53908/-88.10249)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Mill Branch watershed for biological and water quality monitoring as part of the 2009 Assessment of the Tennessee (TN) River Basin. The objectives of this project were to assess the biological integrity of each monitoring location and to estimate overall water quality within the TN basin. A habitat and macroinvertebrate assessment were conducted on Mill Branch at MLBF-1 on June 23, 2009.

Figure 1. Mill Branch at MLBF-1, facing downstream.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Mill Branch is a *Fish and Wildlife (F&W)* stream located in the Tennessee River basin. The stream drains approximately five square miles of countryside, with a low population density and less than 3% development. Based on the 2006 National Land Cover Dataset, landuse within the watershed is primarily forest (70%) with some shrub/scrub areas. As of September 12, 2012, no NPDES permits have been issued in 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. Mill Branch at MLBF-1 is a low-gradient, sand-bottomed stream lacking riffle habitat (Figure 1). Overall habitat quality was categorized as *sub-optimal*.

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 in comparison to reference reaches in the same ecoregion. The final score is the average of all individual metric scores. Metric results indicated the macroinvertebrate community to be in *good* condition (Table 4). However, *Polypedilum* spp (Chironomidae), a nutrient tolerant group, comprised 34% of the total number of organisms collected.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Tennessee River
Drainage Area (mi^2)		5
Ecoregion[a]		65j
% Landuse		
Open water		<1
Wetland	Woody	<1
	Emergent herbaceous	<1
Forest	Deciduous	37
	Evergreen	30
	Mixed	3
Shrub/scrub		22
Pasture/hay		5
Cultivated crops		<1
Development	Open space	2
	Low intensity	<1
Population/km^{2}[b]		5

a. Transition Hills
b. 2000 US Census

Table 2. Physical characteristics of Mill Branch at MLBF-1, June 23, 2009.

Physical Characteristics		
Width (ft)		15
Canopy Cover		Mostly Shaded
Depth (ft)		
	Run	1.0
	Pool	3.0
% of Reach		
	Run	70
	Pool	30
% Substrate		
	Clay	3
	Cobble	1
	Mud/Muck	3
	Gravel	10
	Sand	70
	Silt	5
	Organic Matter	8

Table 3. Results of the habitat assessment conducted on Mill Branch at MLBF-1, June 23, 2009.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	49	Marginal (40-52)
Sediment Deposition	65	Sub-optimal (53-65)
Sinuosity	70	Sub-optimal (65-84)
Bank and Vegetative Stability	66	Sub-optimal (60-74)
Riparian Buffer	80	Sub-optimal (70-89)
Habitat Assessment Score	**140**	
% Maximum Score	**64**	**Sub-optimal (53-65)**

Table 4. Results of the macroinvertebrate assessment conducted on Mill Branch at MLBF-1, June 23, 2009.

Macroinvertebrate Assessment	Results	Scores (0-100)
Taxa richness and diversity measures		
# EPT taxa	14	43
Shannon Diversity	3.74	48
Taxonomic composition measures		
% EPT minus Baetidae and Hydropsychidae	1	1
% Non-insect taxa	10	65
Functional feeding group		
% Predator Individuals	16	64
Community tolerance		
% Tolerant taxa	32	48
WMB-I Assessment Score	---	**45**
WMB-I Assessment Rating		**Good (44-72)**

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. In situ measurements and water samples were collected monthly, semi-monthly (metals), or quarterly (pesticides, atrazine, and semi-volatile organics) during March through October of 2009 to help identify any stressors to the biological communities. The maximum stream flow was measured in March, and decreased steadily to 0.3 cfs in July. Flow was estimated to be <0.1 cfs in September and could not be measured. Dangerous conditions during a storm prevented a flow measurement in October.

Dissolved oxygen was 4.7 mg/L during very low conditions in September. Stream pH was 5.9 su in June. E. coli was 687 colonies/100 mL in August. During the high flow event in October, dissolved copper exceeded acute and chronic criteria applicable to Mill Branch's *F&W* use classification. Median total metals (iron and manganese) and dissolved manganese were higher than expected, based on 90th percentile of data collected at reference reaches within the Transition Hills ecoregion (65j).

SUMMARY

Results for the 2009 bioassessment indicated the macroinvertebrate community to be in *good* condition in Mill Branch at MLBF-1. Habitat conditions were rated as *sub-optimal*. However, lower than normal stream flows during 2009 affected water quality conditions. Monitoring should continue to ensure that water quality and biological conditions remain stable.

Table 5. Summary of water quality data collected March-October, 2009. Minimum (Min) and maximum (Max) values calculated using minimum detection limits (MDL). Median (Med), 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)	9		14.6		26.0	21.8		20.9	3.8	
Turbidity (NTU)	9		5.0		18.4	9.3		10.2	4.3	
[J] Total Dissolved Solids (mg/L)	8	<	1.0		50.0	31.5		31.8	17.2	
[J] Total Suspended Solids (mg/L)	8		3.0		23.0	6.0		9.4	7.6	
Specific Conductance (μmhos)	9		22.0		28.9	26.8		26.0	2.2	
Hardness (mg/L)	4		7.6		9.9	8.8		8.8	1.1	
Alkalinity (mg/L)	8		6.1		11.4	8.1		8.5	2.3	
Stream Flow (cfs)	7		0.3		13.9	2.0		3.4	4.8	
Chemical										
Dissolved Oxygen (mg/L)	9		4.7 [C]		9.1	7.7		7.1	1.7	1
pH (su)	9		5.9 [C]		6.7	6.2		6.3	0.3	1
[BJ] Ammonia Nitrogen (mg/L)	4	<	0.006		0.030	0.003		0.010	0.014	
[BJ] Nitrate+Nitrite Nitrogen (mg/L)	6	<	0.003		0.092	0.045		0.046	0.032	
[BJ] Total Kjeldahl Nitrogen (mg/L)	4	<	0.089		0.410	0.166		0.196	0.183	
[BJ] Total Nitrogen (mg/L)	4	<	0.072		0.468	0.213		0.241	0.186	
[J] Dissolved Reactive Phosphorus (mg/L)	8		0.008		0.093	0.016		0.028	0.028	
[BJ] Total Phosphorus (mg/L)	4		0.012		0.022	0.016		0.016	0.004	
CBOD-5 (mg/L)	8	<	1.0	<	2.0	0.5		0.7	0.3	
Chlorides (mg/L)	8		1.0		12.4	1.5		2.8	3.9	
Atrazine (μg/L)	2	<	0.06	<	0.06	0.03		0.03	0.00	
Total Metals										
[J] Aluminum (mg/L)	4	<	0.060		0.348	0.134		0.161	0.134	
Iron (mg/L)	4		1.050		1.580	1.350 [M]		1.332	0.235	
Manganese (mg/L)	4		0.087		0.134	0.116 [M]		0.113	0.021	
Dissolved Metals										
Aluminum (mg/L)	4	<	0.033	<	0.060	0.030		0.027	0.007	
Antimony (μg/L)	4	<	0.7	<	6.0	3.0		2.3	1.3	
Arsenic (μg/L)	4	<	0.4	<	0.4	0.2		0.2	0.0	
Cadmium (mg/L)	4	<	0.002	<	0.003	0.001		0.001	0.000	
Chromium (mg/L)	4	<	0.007	<	0.013	0.004		0.004	0.002	
[J] Copper (mg/L)	4		0.021 [S]	<	0.200	0.100		0.080	0.040	1
[J] Iron (mg/L)	4	<	0.026		0.353	0.117		0.150	0.146	
Lead (μg/L)	4	<	1.0	<	1.5	0.8		0.7	0.1	
Manganese (mg/L)	4		0.080		0.121	0.098 [M]		0.100	0.017	
[BJ] Mercury (μg/L)	2	<	0.1	<	0.1	0.0		0.0	0.0	
Nickel (mg/L)	4	<	0.008	<	0.019	0.004		0.005	0.003	
Selenium (μg/L)	4	<	0.4	<	0.4	0.2		0.2	0.0	
Silver (mg/L)	4	<	0.001	<	0.002	0.001		0.001	0.000	
Thallium (μg/L)	4	<	0.4	<	0.4	0.2		0.2	0.0	
Zinc (mg/L)	4	<	0.030	<	0.060	0.030		0.026	0.008	
Biological										
Chlorophyll a (μg/L)	8	<	0.10		3.20	0.50		0.94	1.04	
[J] Fecal Coliform (col/100 mL)	8		50		1300	96		352	446	
[J] E. coli (col/100mL)	1							687 [C]		

J=estimate; B=samples excluded due to laboratory QC concerns; N=# samples; C=*F&W* criterion violated; S=*F&W* hardness-adjusted aquatic life use criterion violated; E=# samples that violate criterion; M=value >90% of all verified ecoregional reference reach data collected in the ecoregion 65j.