Alabama Department of Environmental Management

NPS Intensive Monitoring

Rivers and Streams Monitoring Program

2014 Monitoring Summary

Fair

Mill Creek at Broad Street in Phoenix City (Russell County) (34.46560/-85.00078)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected Mill Creek for biological and water quality monitoring in order to fulfill the requirements of Section 319(b) of the Clean Water Act. Under this section, it is mandated that all states develop and implement non-point source monitoring programs using shared information and experience with the goal of reducing the amount of surface run-off and other man-made sources of pollution.

Mill Creek was first placed on Alabama's 303(d) list in 2006 based on data collected in 1999. A nine mile segment was listed for organic enrichment from urban development. The data collected will be used to develop a TMDL for organic enrichment.

Watershed Management Plans (WMP's) are developed and implemented in order to improve overall water quality within the impaired water body. The WMP for Mill Creek includes stream bank stabilization. storm drain retrofits and constructing a storm water wetland. Mill Creek at MICR-1 was monitored to document conditions within the watershed prior to implementation of the WMP.

Figure 1. Mill Creek at MICR-1 July 15, 2014

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Mill Creek at MICR-1 is a *Fish & Wildlife (F&W)* stream located in Phoenix City. Based on the 2011 National Land Cover Dataset, landuse within the watershed is primarily urban development (60%) and forest (23%). Population density is relatively high. As of April 1, 2016 there are 90 NPDES permitted outfalls active 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 Creek at MICR-1 is a shallow, high-gradient stream reach characterized by sand, gravel and cobble substrates (Figure 1). Overall habitat quality was categorized as *marginal* due to lack of bank stability.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Chattahoochee River
Drainage Area (mi^2)		25
Ecoregion[a]		65I
% Landuse[b]		
Open water		1%
Wetland	Woody	1%
	Emergent herbaceous	<1%
Forest	Deciduous	10%
	Evergreen	8%
	Mixed	5%
Shrub/scrub		9%
Grassland/herbaceous		1%
Pasture/hay		3%
Cultivated crops		1%
Development	Open space	28%
	Low intensity	20%
	Moderate intensity	9%
	High intensity	3%
Barren		<1%
Population/km^2[c]		372
# NPDES Permits[d]	**TOTAL**	90
Construction		77
Industrial General		11
Small Mining		2

a. Fall Line Hills

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 Mill Creek at MICR-1, May 21, 2014.

Physical Characteristics		
Width (ft)		30
Canopy Cover		Mostly Shaded
Depth (ft)		
	Riffle	0.5
	Run	1.5
	Pool	1.5
% of Reach		
	Riffle	5
	Run	80
	Pool	15
% Substrate		
	Bedrock	2
	Boulder	3
	Cobble	10
	Gravel	15
	Sand	63
	Silt	5
	Organic Matter	2

Table 3. Results of the habitat assessment conducted on Mill Creek at MICR-1, May 21, 2014.

Habitat Assessment	% Maximum Score	Rating
Instream Habitat Quality	59	Sub-Optimal (55-79)
Sediment Deposition	31	Marginal (31-<55)
Riffle frequency	45	Marginal (31-<55)
Bank Vegetative Stability	30	Poor (<31)
Riparian Buffer	48	Marginal (31-<60)
Habitat Assessment Score	**88**	
% Maximum Score	**46**	**Marginal (31-<57)**

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. Metric results indicated the macroinvertebrate community to be in *fair* condition (Table 4), and indicate a significant improvement in biological conditions since the site was first sampled in 1999. Forty-three total taxa were collected, an increase from the total number of taxa collected at the site in 1999 (31) and 2008 (34). Eight EPT taxa were also collected, also an increase from the number of taxa collected in 1999 (1) and 2008 (4). Two EPT taxa are classified as pollution tolerant. In previous year, no sensitive EPT have been collected.

Table 4. Results of the macroinvertebrate bioassessment conducted in Mill Creek at MICR-1 on May 21, 2014.

Macroinvertebrate Assessment		
	Results	**Scores**
Taxa richness and diversity measures		**(0-100)**
% EPC taxa	23	30
% Dominant Taxon	22	72
Taxonomic composition measures		
% EPT minus Baetidae and Hydropsychidae	0	0
Functional feeding group		
# Collector Taxa	20	65
Community tolerance		
% Nutrient Tolerant individuals	39	44
WMB-I Assessment Score	**---**	**42**
WMB-I Assessment Rating		**Fair (32-47)**

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. *In situ* measurements and water samples were collected monthly, March through October of 2014, to identify any stressors to the biological community. No metals or organic samples were collected. Median conductivity, alkalinity and chloride concentrations were above background levels based on reference reach data collected in ecoregion 65i.

Table 5. Summary of water quality data collected March-October, 2014. 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
Physical						
Temperature (°C)	9	13.8	27.9	20.7	21.4	5.0
Turbidity (NTU)	9	3.6	55.3	11.9	17.1	19.1
J Total Dissolved Solids (mg/L)	8	51.0	88.0	75.5 M	73.4	11.0
J Total Suspended Solids (mg/L)	8	1.0	33.0	6.5	11.4	12.0
Specific Conductance (µmhos)	9	59.1	132.9	99.2 G	96.9	26.1
Alkalinity (mg/L)	8	13.0	47.1	30.3 M	30.0	12.4
Stream Flow (cfs)	6	1.7	14.0	5.0	5.8	4.4
Chemical						
Dissolved Oxygen (mg/L)	9	6.8	10.5	8.9	8.9	1.0
pH (su)	9	6.5	8.1	7.2	7.1	0.5
Ammonia Nitrogen (mg/L)	8	< 0.006	0.168	0.003	0.024	0.056
Nitrate+Nitrite Nitrogen (mg/L)	8	0.157	0.273	0.232	0.222	0.047
Total Kjeldahl Nitrogen (mg/L)	8	0.252	1.620	0.532	0.637	0.427
Total Nitrogen (mg/L)	8	0.448	1.780	0.768	0.860	0.408
J Dissolved Reactive Phosphorus (mg/L)	8	0.004	0.018	0.010	0.011	0.005
Total Phosphorus (mg/L)	8	0.021	0.058	0.036	0.038	0.014
J CBOD-5 (mg/L)	8	< 2.0 <	2.0	1.0	1.0	0.0
Chlorides (mg/L)	8	5.1	10.3	9.0 M	8.3	2.1
Biological						
Chlorophyll a (ug/L)	8	< 0.10	5.34	2.27	2.10	1.75

G=value higher than median concentration of all verified ecoregional reference reach data collected in the ecoregion 65i; J=estimate; M=value >90% of all verified ecoregional reference reach data collected in the ecoregion 65i; N=# samples.

SUMMARY

Bioassessment results indicated the macroinvertebrate community to be in *fair* condition, and indicate a significant improvement in biological conditions since the site was first sampled in 1999. However, overall habitat quality was scored as *marginal*. Additionally, some water quality parameters were higher than expected, based on data from least impaired ecoregional reference reach data collected in ecoregion 65i. Monitoring at Mill Creek at MICR-1 should continue to document trends in physical, biological and water quality conditions within the reach.

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