

2010 Monitoring Summary



Basin Assessment Site

Morgan Creek in Shelby County at Dead Hollow Road (33.29029/-86.45590)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Morgan Creek watershed for biological and water quality monitoring as part of the 2010 Alabama, Coosa, Tallapoosa Basin Assessment Monitoring. The objectives of this project were to assess the biological integrity of each monitoring site and to estimate overall water quality within the ACT basin groups.

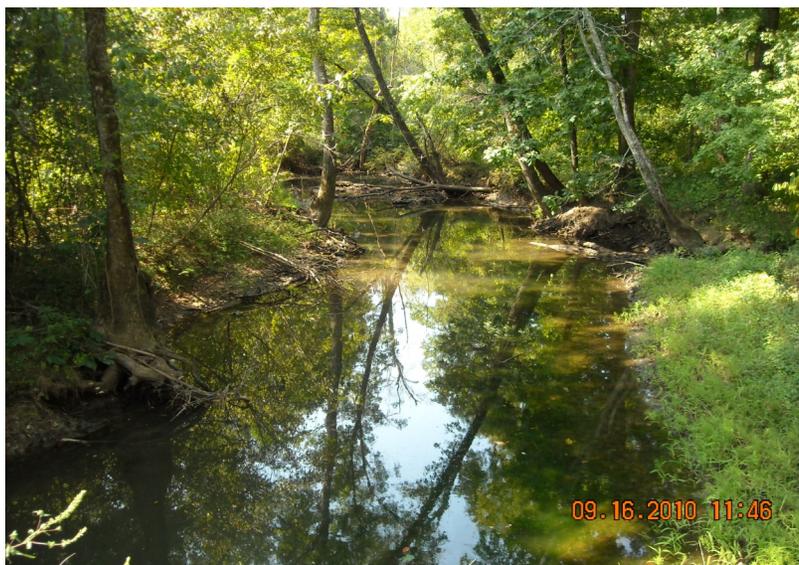


Figure 1. Morgan Creek at MRGS-1, September 16, 2010.

WATERSHED CHARACTERISTICS

Morgan Creek is a *Fish & Wildlife (F&W)* stream that is located approximately 9.5 miles south of Harpersville in Shelby County. Based on the 2006 National Land Cover Dataset, almost half (49%) of the land within the watershed is used for agricultural activities (Table 1). As of September 1, 2012, ADEM's NPDES Management System database shows a total of six 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.

Morgan Creek at MRGS-1 is a mostly-shaded stream reach with a bottom substrate dominated by gravel and sand (Figure 1). This reach lies in the Southern Limestone/Dolomite Valleys and Low Rolling Hills ecoregion (67f). Habitat quality and availability was rated as *sub-optimal* for supporting diverse aquatic 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. Metric results indicated the macroinvertebrate community to be characterized by pollution-tolerant taxa groups, indicating *poor* community condition (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Coosa River
Drainage Area (mi²)		12
Ecoregion^a		67f
% Landuse		
Open water		<1
Wetland	Woody	9
Forest	Deciduous	21
	Evergreen	6
	Mixed	3
Shrub/scrub		1
Grassland/herbaceous		4
Pasture/hay		27
Cultivated crops		22
Development	Open space	5
	Low intensity	2
	Moderate intensity	<1
	High intensity	<1
Barren		<1
Population/km^{2b}		35
# NPDES Permits^c	TOTAL	6
	Construction Stormwater	5
	Industrial General	1

a. Southern Limestone/Dolomite Valleys and Low Rolling Hills

b. 2000 US Census

c. #NPDES permits downloaded from ADEM's NPDES Management System database, September 1, 2012.

Table 2. Physical characteristics of Morgan Creek at MRGS-1, May 18, 2010.

Physical Characteristics		
Width (ft)		20
Canopy Cover		Mostly Shaded
Depth (ft)		
	Riffle	0.7
	Run	1.3
	Pool	1.0
% of Reach		
	Riffle	10
	Run	80
	Pool	10
% Substrate		
	Boulder	5
	Cobble	15
	Gravel	30
	Sand	25
	Silt	8
	Organic Matter	17

Table 3. Results of the habitat assessment conducted on Morgan Creek at MRGS-1, May 18, 2010.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	68	Sub-optimal (59-70)
Sediment Deposition	70	Sub-optimal (59-70)
Sinuosity	55	Marginal (45-64)
Bank and Vegetative Stability	54	Marginal (35-59)
Riparian Buffer	90	Optimal (>89)
Habitat Assessment Score	163	
% Maximum Score	68	Sub-optimal (59-70)

Table 4. Results of the macroinvertebrate bioassessment conducted in Morgan Creek at MRGS-1, May 18, 2010.

Macroinvertebrate Assessment		
	Results	Scores (0-100)
Taxa richness and diversity measures		
# EPT taxa	17	57
Shannon Diversity	3.79	51
Taxonomic composition measures		
% EPT minus Baetidae and Hydropsychidae	20	20
% Non-insect taxa	13	49
Tolerance measures		
% Tolerant taxa	33	45
WMB-I Assessment Score	---	44
WMB-I Assessment Rating		Poor (23-46)

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. In situ measurements and water samples were collected May, July, September, and November of 2010 to help identify any stressors to the biological communities. Median total dissolved solids, specific conductance, hardness, alkalinity, chlorides, total manganese, dissolved copper and dissolved manganese values were higher than background levels based on reference reach data collected in this ecoregion. In September and November of 2010, arsenic and mercury exceeded both the aquatic life use and human health criteria when flows were estimated to be <0.1 cfs. Samples were collected in July and November 2010 for analysis of pesticides, semi-volatile organics and atrazine. All concentrations were below detection limits.

SUMMARY

Bioassessment results indicated the macroinvertebrate community in Morgan Creek at MRGS-1 to be in *poor* condition. Intensive water chemistry results indicated higher than expected conductivity, hardness, and metals. However, results may have been affected by the lower than normal stream flows experienced during 2010. Additional low-level metals sampling may be necessary to determine if the criteria exceedances are due to natural conditions or anthropogenic sources.

Table 5. Summary of water quality data collected May-November, 2010. 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
Physical							
Temperature (°C)	5	14.4	27.2	22.8	22.0	4.7	
Turbidity (NTU)	5	3.4	10.2	7.1	6.9	2.7	
Total Dissolved Solids (mg/L)	4	176.0	215.0	186.0 ^M	190.8	16.9	
Total Suspended Solids (mg/L)	4	4.0	11.0	6.0	6.8	3.0	
Specific Conductance (µmhos)	5	297.0	342.0	320.0 ^G	319.6	15.9	
Hardness (mg/L)	4	152.0	173.0	160.5 ^G	161.5	8.9	
Alkalinity (mg/L)	4	126.7	147.1	131.6 ^M	134.2	9.5	
Stream Flow (cfs)	3	0.8	8.5	3.5	4.3	3.9	
Chemical							
Dissolved Oxygen (mg/L)	5	5.3 ^C	7.8	6.8	6.8	1.0	
pH (su)	5	7.2	7.9	7.7	7.6	0.3	
^J Nitrate+Nitrite Nitrogen (mg/L)	4	0.030	0.460	0.144	0.195	0.202	
^J Dissolved Reactive Phosphorus (mg/L)	4	0.004	0.009	0.007	0.007	0.002	
CBOD-5 (mg/L)	4	< 1.0	1.0	0.5	0.5	0.0	
Chlorides (mg/L)	4	5.1	22.5	15.1 ^M	14.5	7.4	
Atrazine (µg/L)	2	< 0.02	0.02	0.01	0.01	0.00	
Total Metals							
^J Aluminum (mg/L)	4	0.044	0.273	0.128	0.143	0.101	
^J Iron (mg/L)	4	0.118	0.323	0.211	0.216	0.105	
Manganese (mg/L)	4	0.054	0.157	0.074	0.090	0.046	
Dissolved Metals							
Aluminum (mg/L)	4	< 0.020	0.020	0.010	0.010	0.000	
Antimony (µg/L)	4	< 0.5	0.5	0.2	0.2	0.0	
Arsenic (µg/L)	4	< 1.0	1.8 ^H	0.9	1.0	0.6	2
Cadmium (µg/L)	4	< 0.400	0.400	0.200	0.200	0.000	
^J Chromium (mg/L)	4	< 0.002	0.004	0.001	0.002	0.002	
Copper (mg/L)	4	< 0.200	0.200	0.100	0.100	0.000	
Iron (mg/L)	4	< 0.030	0.030	0.015	0.015	0.000	
^J Lead (µg/L)	4	< 2.0	2.0	1.0	1.0	0.0	
^J Manganese (mg/L)	4	0.036	0.135	0.050	0.068	0.046	
^B Mercury (µg/L)	3	< 0.200	0.537 ^{AH}	0.464	0.367	0.234	2
Nickel (mg/L)	4	< 0.005	0.005	0.002	0.002	0.000	
^J Selenium (µg/L)	4	< 1.2	2.0	0.6	1.0	0.7	
Silver (µg/L)	4	< 1.000	1.000	0.500	0.500	0.000	
Thallium (µg/L)	4	< 0.7	0.7	0.4	0.4	0.0	
Zinc (mg/L)	4	< 0.030	0.030	0.015	0.015	0.000	
Biological							
Chlorophyll a (ug/L)	4	< 1.00	3.92	0.78	1.50	1.64	
E. coli (col/100mL)	4	20	108	51	58	38	

A=F&W aquatic life use criterion exceeded; B=samples excluded due to laboratory QC concerns; E=# samples that exceeded criteria; G=value higher than median concentration of all verified ecoregional reference reach data collected in the ecoregion 67f; H=F&W human health criteria exceeded; J=estimate; M=value >90% of all verified ecoregional reference reach data collected in the ecoregion 67f; N=# samples

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