Alabama Department of Environmental Management

Ecological Reference Reach

Rivers and Streams Monitoring Program

2013 Monitoring Summary

Mannings Creek at Pike County Road 7718 (31.93409/-85.95741)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) monitored Mannings Creek is among the least-disturbed watersheds within the Southern Hilly Gulf Coastal Plain ecoregion based on landuse, road density, and population density. The site was monitored to evaluate its use as a "best attainable condition" reference watershed for comparison with other streams in the ecoregion.

Additionally, Mannings Creek was selected for biological and water quality monitoring as part of the 2013 Surface Water Quality Plan. The objectives were to assess the biological integrity and to estimate overall water quality.

Figure 1. Mannings Creek at MANP-1, May 9, 2013.

WATERSHED CHARACTERISTICS

Watershed charatcteristics are summarized in Table 1. Mannings Creek at MANP-1 is a *Fish & Wildlife (F&W)* stream located in Pike County, approximately nine miles north of Troy. According to the 2006 National Land Cover Dataset, landuse within the watershed is primarily forest (67%). As of September 1, 2012, there were two outfalls active 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. Mannings Creek at MANP-1 is a low-gradient, sand-bottomed stream, typical of other streams within the Southern Hilly Gulf Coastal Plain ecoregion (Figure 1). Overall habitat quality was rated as *sub-optimal.*

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Perdido-Escambia River
Drainage Area (mi^2)		39
Ecoregion[a]		65d
% Landuse		
Open water		1
Wetland	Woody	7
	Emergent herbaceous	<1
Forest	Deciduous	19
	Evergreen	39
	Mixed	9
Shrub/scrub		13
Grassland/herbaceous		3
Pasture/hay		4
Cultivated crops		1
Development	Open space	2
	Low intensity	<1
	Moderate intensity	<1
Population/km^2[b]		4
# NPDES Permits[c]	**TOTAL**	2
Construction Stormwater		1
Industrial Individual		1

a.Southern Hilly Gulf Coastal Plain

b.2000 US Census

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

Table 2. Physical characteristics of Mannings Creek at MANP-1, May 9, 2013.

Physical Characteristics		
Width (ft)		17
Canopy Cover		Shaded
Depth (ft)		
	Run	1.5
	Pool	3
% of Reach		
	Run	70
	Pool	30
% Substrate		
	Mud/Muck	2
	Sand	62
	Silt	5
	Organic Matter	31

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 in comparison to conditions expected in coastal plain Alabama streams and rivers. Each site is placed in one of six levels, ranging from 1, or *natural* to 6, or *highly altered*. The macroinvertebrate survey conducted at MANP-1 rated the site as a 4, or *fair* (Table 4).

Table 3. Results of the habitat assessment conducted in Mannings Creek at MANP-1, May 9, 2013.

Habitat Assessment	% Maximum Score	Rating
Instream Habitat Quality	53	Sub-optimal (53-65)
Sediment Deposition	63	Optimal (> 65)
Sinuosity	70	Sub-optimal (65-84)
Bank and Vegetative Stability	60	Sub-optimal (60-74)
Riparian Buffer	90	Optimal (>89)
Habitat Assessment Score	**119**	
% Maximum score	**66**	**Sub-optimal (57-80)**

Table 4. Results of the macroinvertebrate bioassessment conducted in Mannings Creek at MANP-1, May 9, 2013.

Macroinvertebrate Assessment	
	Results
Taxa richness and diversity measures	
Total # Taxa	46
# EPT taxa	10
# Highly-sensitive and Specialized Taxa	0
Taxonomic composition measures	
% EPC taxa	28
% EPT minus Baetidae and Hydropsychidae	19
% Chironomidae Individuals	38
% Dominant Taxon	10
% Individuals in Dominant 5 Taxa	44
Functional feeding group	
# Collector Taxa	22
% Tolerant Filterer Taxa	10
Community tolerance	
# Sensitive EPT	3
% Sensitive taxa	18
% Nutrient Tolerant individuals	22
WMB-I Assessment Score	**4**
WMB-I Assessment Rating	**Fair**

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. When possible, in situ measurements and water samples were collected monthly or semi-monthly (metals) from March through October 2013 to help identify potential stressors to the biological communities.

Turbidity was elevated during a high flow event on July 2, 2013 (flow=20.3 cfs). Stream pH was <6.0 su during the March and May sampling visits. Median concentrations of total kjeldahl nitrogen, total nitrogen, total aluminum, total iron, and dissolved iron were higher than expected based on verified reference reach data collected in ecoregion 65d.

SUMMARY

Mannings Creek at MANP-1 was a typical low gradient, sand bottomed stream reach. Although there are two NPDES outfalls active within the watershed, Mannings Creek is among the least-disturbed watersheds within ecoregion 65d. The habitat assessment indicated the reach to be in *sub-optimal* condition for this stream type. However, nitrogen and some metals concentrations were higher than expected for this ecoregion. The macroinvertebrate community was in *fair* condition. Further monitoring is needed to ensure that physical, chemical, and biological conditions remain stable.

Table 5. Summary of water quality data collected March-October, 2013. Minimum (Min) and maximum (Max) values calculated using minimum detection limits (MDL) when results were less than this value for non-metals parameters. 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	Q
Physical								
Temperature (°C)	8	10.9	24.4	18.2	18.6	4.4		
Turbidity (NTU)	8	13.9	235.0 T	21.5	48.6	75.6	1	
J Total Dissolved Solids (mg/L)	7	32.0	141.0	76.0	72.4	35.9		
J Total Suspended Solids (mg/L)	7	2.0	139.0	11.0	27.6	49.4		
Specific Conductance (µmhos)	8	31.4	68.6	39.6	46.8	14.3		
Hardness (mg/L)	2	15.9	19.5	17.7	17.7	2.5		
J Alkalinity (mg/L)	7	3.8	24.1	10.3	13.4	8.0		
Stream Flow (cfs)	7	0.4	30.9	9.7	13.4	10.8		
Chemical								
Dissolved Oxygen (mg/L)	8	5.9	8.9	7.2	7.4	1.1		
pH (su)	8	5.4 C	6.6	6.3	6.2	0.4	2	
Ammonia Nitrogen (mg/L)	7	0.021	0.090	0.040	0.048	0.024		
J Nitrate+Nitrite Nitrogen (mg/L)	7	0.005	0.163	0.020	0.043	0.057		
Total Kjeldahl Nitrogen (mg/L)	7	0.366	2.480	0.819 M	0.977	0.729		
J Total Nitrogen (mg/L)	7	0.390	2.643	0.839 M	1.020	0.779		
J Dissolved Reactive Phosphorus (mg/L)	7	0.004	0.127	0.005	0.023	0.046		
Total Phosphorus (mg/L)	7	0.027	0.296	0.038	0.073	0.099		
J CBOD-5 (mg/L)	7	< 2.0	< 2.0	1.0	1.0	0.0		
Chlorides (mg/L)	7	2.3	3.6	2.7	2.9	0.4		
Total Metals								
Aluminum (mg/L)	2	0.407	5.830	3.118 M	3.118	3.835		
Iron (mg/L)	2	4.140	9.650	6.895 M	6.895	3.896		
Manganese (mg/L)	2	0.085	0.237	0.161	0.161	0.107		
Dissolved Metals								
J Aluminum (mg/L)	2	0.083	0.138	0.110	0.110	0.039		
Antimony (µg/L)	2	< 0.1	< 0.1	0.1	0.1	0.0		
J Arsenic (µg/L)	2	1.0 H	1.1 H	1.0	1.0	0.0		2
Cadmium (µg/L)	2	< 0.170	< 0.170	0.085	0.085	0.000		
J Chromium (mg/L)	2	1.780	2.090	1.935	1.935	0.219		
J Copper (mg/L)	2	< 0.0003	0.003 S	0.002	0.002	0.002		1
Iron (mg/L)	2	0.727	2.550	1.638 M	1.638	1.289		
J Lead (µg/L)	2	0.2	0.6 S	0.4	0.4	0.3		1
Manganese (mg/L)	2	0.073	0.125	0.099	0.099	0.037		
J Nickel (mg/L)	2	0.001	0.001	0.001	0.001	0.000		
Selenium (µg/L)	2	< 0.2	< 0.2	0.1	0.1	0.0		
Silver (µg/L)	2	< 2.120	< 2.120	1.060	1.060	0.000		
Thallium (µg/L)	2	< 0.1	< 0.1	0.1	0.1	0.0		
J Zinc (mg/L)	2	0.003	0.005	0.004	0.004	0.002		
Biological								
Chlorophyll a (µg/L)	4	< 0.10	2.67	2.58	1.97	1.28		
J E. coli (col/100mL)	4	131	> 2420 H	200	738	1122		1

C= *F&W* criteria violated; E=# samples that exceeded criteria; H=*F&W* human health criteria exceeded; J=estimate; M=value >90% of all verified ecoregional reference reach data collected in the ecoregion 65d; N=# samples; Q=# of samples that it is uncertain if an exceedance of criteria occurred; S=*F&W* hardness-adjusted aquatic life use criteria exceeded; T=value exceeds 50 NTU above the 90th percentile of all verified ecoregional reference reach data collected in ecoregion 65d.

FOR MORE INFORMATION, CONTACT:
Rebekah Taylor, ADEM Aquatic Assessment Unit
1350 Coliseum Boulevard Montgomery, AL 36110
(334) 260-2759 Rebekah.taylor@adem.state.al.us