Alabama Department of Environmental Management

Basin Assessment Site

Rivers and Streams Monitoring Program

2009 Monitoring Summary

Anderson Creek at Snake Road Bridge (Lauderdale County) (34.85150/-87.23610)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Anderson Creek 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 site and to estimate overall water quality within the Tennessee River basin.

Figure 1. Anderson Creek at ANDL-8, July 15, 2009.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Anderson Creek at ANDL-8 is a *Fish & Wildlife (F&W)* stream located in the Western Highland Rim ecoregion (71f). Based on the 2006 National Land Cover Dataset, land cover within the watershed is primarily forest (29%) and pasture/ hay, with some development and cultivated crops. As of September 1, 2012, ADEM's NPDES Management System database shows nine permitted discharges located 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.

Anderson Creek at ANDL-8 is characterized by an open-canopy and cobble, gravel and bedrock substrates (Figure 1). Overall habitat quality was categorized as *optimal* as a result of high instream habitat quality and low sediment deposition.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Tennessee R
Drainage Area (mi^2)		49
Ecoregion[a]		71f
% Landuse		
Open water		<1
Wetland	Woody	2
	Emergent herbaceous	<1
Forest	Deciduous	22
	Evergreen	3
	Mixed	4
Shrub/scrub		5
Grassland/herbaceous		1
Pasture/hay		48
Cultivated crops		9
Development	Open space	6
	Low intensity	<1
	Moderate intensity	<1
Population/km^2[b]		17
# NPDES Permits[c]	**TOTAL**	9
Construction Stormwater		3
Industrial General		2
Municipal Individual		4

a.Western Highland Rim

b.2000 US Census

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

Table 2. Physical characteristics of Anderson Creek at ANDL-8, July 1, 2009.

Physical Characteristics		
Width (ft)		35
Canopy cover		Open
Depth (ft)	Riffle	0.4
	Run	1.0
	Pool	1.0
% of Reach	Riffle	5
	Run	75
	Pool	20
% Substrate	Bedrock	30
	Boulder	2
	Cobble	28
	Gravel	20
	Sand	5
	Silt	3
	Organic Matter	2

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 least impaired reference reaches in the same ecoregion. The final score is the average of all individual scores. Metric results indicated the macroinvertebrate community in Anderson Creek at ANDL-8 to be in *fair* condition (Table 4).

Table 3. Results of the habitat assessment conducted in Anderson Creek at ANDL-8, July 1, 2009.

Habitat Assessment	(% Maximum Score)	Rating
Instream habitat quality	73	Optimal > 70
Sediment deposition	77	Optimal > 70
Sinuosity	73	Sub-optimal (65-84)
Bank and vegetative stability	70	Sub-optimal (60-74)
Riparian buffer	85	Sub-optimal (70-89)
Habitat assessment score	**180**	
% Maximum score	**75**	**Optimal > 70**

Table 4. Results of the macroinvertebrate bioassessment conducted in Anderson Creek at ANDL-8, July 1, 2009.

Macroinvertebrate Assessment		
	Results	**Scores**
Taxa richness and diversity measures		**(0-100)**
# EPT taxa	13	39
Shannon Diversity	4.06	63
Taxonomic composition measures		
% EPT minus Baetidae and Hydropsychidae	27	60
% Non-insect taxa	10	61
Functional feeding group		
% Predator Individuals	5	0
Community tolerance		
% Tolerant taxa	33	46
WMB-I Assessment Score	**---**	**34**
WMB-I Assessment Rating		**Fair (29-43)**

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 median concentration of nitrate+nitrite nitrogen was above the 90th percentile of reference reach data collected within the Western Highland Rim ecoregion. Stream pH was above the *F&W* use classification criterion during August. Flow was 30.5 cfs during this site visit.

SUMMARY

Bioassessment results indicated the macroinvertebrate community in Anderson Creek at ANDL-8 to be in *fair* condition. Habitat conditions were rated as *optimal* for macroinvertebrate communities. However, the median concentration of nitrate+nitrite nitrogen was elevated as compared to data from ADEM's least-impaired reference reaches in ecoregion 71f. Stream pH exceeded the *F&W* criterion during one sampling event. Monitoring should continue to ensure that biological and water quality conditions remain stable.

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Table 5. Summary of water quality data collected March-October, 2009. 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	Median	Avg	SD	E
Physical							
Temperature (°C)	9	11.5	29.1	21.8	20.2	6.4	
Turbidity (NTU)	9	2.0	5.1	2.4	2.8	1.0	
J Total Dissolved Solids (mg/L)	8	< 1.0	90.0	66.0	55.6	32.0	
Total Suspended Solids (mg/L)	8	< 1.0	3.0	1.0	1.3	0.9	
Specific Conductance (µmhos)	9	77.4	123.1	107.5	103.8	16.6	
Hardness (mg/L)	4	32.6	54.0	41.4	42.4	9.8	
Alkalinity (mg/L)	8	26.8	52.0	39.0	38.8	9.2	
Stream Flow (cfs)	9	12.0	75.4	36.6	41.5	22.2	
Chemical							
Dissolved Oxygen (mg/L)	9	8.6	10.9	10.1	9.8	0.8	
pH (su)	9	7.2	8.6 C	7.7	7.9	0.5	1
Ammonia Nitrogen (mg/L)	8	< 0.006	0.014	0.007	0.006	0.002	
Nitrate+Nitrite Nitrogen (mg/L)	8	0.765	1.133	0.876 M	0.928	0.154	
Total Kjeldahl Nitrogen (mg/L)	8	< 0.089	0.335	0.122	0.154	0.107	
Total Nitrogen (mg/L)	8	< 0.810	1.370	1.111	1.083	0.193	
J Dissolved Reactive Phosphorus (mg/L)	8	0.009	0.038	0.015	0.018	0.009	
J Total Phosphorus (mg/L)	8	0.012	0.045	0.022	0.024	0.010	
CBOD-5 (mg/L)	8	< 2.0	< 2.0	1.0	1.0	0.0	
Chlorides (mg/L)	8	2.9	3.8	3.2	3.3	0.3	
Atrazine (µg/L)	2	< 0.06	0.19	0.11	0.11	0.11	
Total Metals							
J Aluminum (mg/L)	4	0.034	0.17	0.086	0.094	0.059	
J Iron (mg/L)	4	0.049	0.09	0.071	0.070	0.018	
J Manganese (mg/L)	4	0.005	0.018	0.012	0.012	0.005	
Dissolved Metals							
J Aluminum (mg/L)	4	< 0.019	0.035	0.018	0.020	0.011	
Antimony (µg/L)	4	< 0.7	2.0	0.4	0.5	0.3	
Arsenic (µg/L)	4	< 0.4	1.6	0.2	0.4	0.3	
Cadmium (mg/L)	4	< 0.003	< 0.003	0.002	0.002	0.000	
Chromium (mg/L)	4	< 0.013	< 0.013	0.006	0.006	0.000	
Copper (mg/L)	4	< 0.013	< 0.013	0.006	0.006	0.000	
J Iron (mg/L)	4	< 0.017	0.033	0.020	0.022	0.009	
Lead (µg/L)	4	< 0.6	1.0	0.5	0.5	0.1	
J Manganese (mg/L)	4	< 0.001	0.008	0.006	0.005	0.003	
Mercury (µg/L)	4	< 0.1	< 0.1	0.0	0.0	0.0	
J Nickel (mg/L)	4	< 0.004	0.019	0.004	0.005	0.004	
Selenium (µg/L)	4	< 0.4	1.5	0.2	0.3	0.3	
Silver (mg/L)	4	< 0.002	< 0.002	0.001	0.001	0.000	
Thallium (µg/L)	4	< 0.4	0.5	0.2	0.2	0.0	
J Zinc (mg/L)	4	< 0.003	0.012	0.002	0.004	0.005	
Biological							
Chlorophyll a (µg/L)	8	< 0.10	1.60	0.53	0.64	0.46	
J Fecal Coliform (col/100 mL)	8	22	210	92	99	55	

N= # samples; J= estimate; M= value > 90th percentile of all verified ecoregional reference reach data collected within ecoregions 71f ; E= # samples that exceeded criteria; C= value exceeds criteria for *Fish & Wildlife* use classification