

2006 Monitoring Summary



Vaughn Creek at Alabama Highway 10 (32.11227/-88.13110)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Vaughn Creek watershed for biological and water quality monitoring as part of the 2006 Assessment of the Escatawpa, Mobile, and Lower Tombigbee (EMT) River Basins. The objectives of the EMT Basin Assessments were to assess the biological integrity of each monitoring site and to estimate overall water quality within the EMT basin group.

Additionally, Vaughn Creek is among the least-disturbed watersheds in the EMT based on landuse, road density, and population density. These data will be used to evaluate the use of Vaughn Creek as a “best attainable” condition reference watershed for comparison with other coastal plain streams.

A habitat and macroinvertebrate assessment were conducted on Vaughn Creek at VANC-1 on May 30, 2006.



Figure 1. Vaughn Creek at VANC-1, February, 2010.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Vaughn Creek is a *Fish & Wildlife (F&W)* stream located in the Southern Hilly Gulf Coastal Plains ecoregion (65d). Landuse within the watershed is forest (71%) and shrub/scrub with small areas of woody wetland, pasture/hay, cultivated crops, and development. Population density is low within the watershed. No NPDES permits have been issued in this watershed as of 18 September 2009.

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, as well as the quality and availability of habitat. Vaughn Creek at VANC-1 is a low-gradient, sand-bottomed stream in the Lower Tombigbee River basin. The habitat assessment categorized the stream as *marginal* due to poor instream habitat quality and a straight stream channel.

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. Metric results indicated the macroinvertebrate community to be in *fair* condition (Table 4) for Vaughn Creek at VANC-1.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin	Lower Tombigbee	
Drainage Area (mi ²)	6	
Ecoregion ^a	65d	
% Landuse		
Wetland	Woody	2
Forest	Deciduous	26
	Evergreen	28
	Mixed	17
Shrub/scrub	22	
Pasture/hay	1	
Cultivated crops	1	
Development	Open space	2
Population/km ^{2b}	6	
# NPDES Permits ^c	TOTAL	0

a.Southern Hilly Gulf Coastal Plain

b.2000 US Census

c.#NPDES permits downloaded from ADEM’s NPDES Management System database, 18 Sep 2009

Table 2. Physical characteristics of Vaughn Creek at VANC-1, May 30, 2006.

Physical Characteristics		
Canopy cover	Mostly Shaded	
Depth (ft)	Run	1.0
	Pool	1.5
% of Reach	Run	85
	Pool	15
% Substrate	Bedrock	5
	Boulder	1
	Cobble	5
	Gravel	24
	Sand	50
	Silt	10
	Organic Matter	5

Table 3. Results of the habitat assessment conducted on Vaughn Creek at VANC-1, May 30, 2006.

Habitat Assessment	% Maximum Score	Rating
Instream habitat quality	38	Poor (<40)
Sediment deposition	63	Sub-optimal (53-65)
Sinuosity	40	Poor (<45)
Bank and vegetative stability	46	Marginal (35-59)
Riparian buffer	73	Sub-optimal (70-89)
Habitat assessment score	113	
% Maximum score	51	Marginal (40-52)

Table 4. Results of the macroinvertebrate bioassessment of Vaughn Creek at VANC-1, May 30, 2006.

Macroinvertebrate Assessment			
	Results	Scores	Rating
Taxa richness measures			
# EPT genera	8	32	Poor (19-37)
Taxonomic composition measures			
% Non-insect taxa	14	57	Poor (30.9-61.8)
% Plecoptera	0	2	Poor (1.86-3.7)
% Dominant taxa	18	81	Good (70.6-85.2)
Functional composition measures			
% Predators	31	100	Excellent (>72.1)
Tolerance measures			
Beck's community tolerance index	4	18	Poor (10.6-21.2)
% Nutrient tolerant organisms	22	80	Good (76.3-88.1)
WMB-I Assessment Score	---	53	Fair (38-56)

WATER CHEMISTRY

Results of water chemistry analyses are summarized in Table 5. When possible, in situ measurements and water samples were collected monthly, semi-monthly (metals), or quarterly (pesticides, herbicides (atrazine), and semi-volatile organics) during March through October at Basin Assessment stations to help identify any stressors to the biological communities. In situ measurements and water samples were not taken at VANC-1 during the months of August, September, and October due to no flow conditions. Data collected at VANC-1 during the 2006 sampling season were similar to the 90th percentile of reference reach data collected in the Southern Hilly Gulf Coastal Plains ecoregion.

CONCLUSIONS

As part of the assessment process, ADEM will review the monitoring information presented in this report, along with all other available data. Bioassessment results indicated the macroinvertebrate community in Vaughn Creek at VANC-1 to be in *fair* condition. Median concentrations of physical, chemical, and biological data collected during 2006 were as expected for streams in the 65d ecoregion. These results suggest a lack of in stream habitat and low flow to be potential causes of the stressed biological conditions.

Table 5. Summary of water quality data collected March-October, 2006. Minimum (Min) and maximum (Max) values calculated using minimum detection limits (MDL) when results were less than this value. 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
Physical						
Temperature (°C)	6	13.0	25.8	20.8	20.4	4.6
Turbidity (NTU)	6	6.3	18.3	7.9	10.2	4.9
Total Dissolved Solids (mg/L)	5	83.0	309.0	103.0	142.4	93.8
Total Suspended Solids (mg/L)	5	< 1.0	7.0	4.0	3.7	2.3
Specific Conductance (µmhos)	6	88.6	113.1	103.5	103.0	9.2
Alkalinity (mg/L)	5	9.6	41.8	29.7	28.4	11.7
Stream Flow (cfs)	6	0.2	5.9	0.8	1.6	2.2
Chemical						
Dissolved Oxygen (mg/L)	6	6.3	9.9	7.2	7.7	1.3
pH (su)	6	6.0	7.2	7.1	6.9	0.5
Ammonia Nitrogen (mg/L)	5	< 0.015	0.019	0.008	0.012	0.006
Nitrate+Nitrite Nitrogen (mg/L)	5	< 0.003	0.105	0.007	0.028	0.044
Total Kjeldahl Nitrogen (mg/L)	5	< 0.150	0.541	0.186	0.275	0.229
Total Nitrogen (mg/L)	5	< 0.076	0.568	0.188	0.304	0.219
Dissolved Reactive Phosphorus (mg/L)	5	< 0.004	0.010	0.005	0.006	0.004
Total Phosphorus (mg/L)	5	< 0.004	0.100	0.050	0.044	0.025
CBOD-5 (mg/L)	5	< 0.7	6.7	0.8	2.0	2.7
COD (mg/L)	2	< 2.0	< 2.0	1.0	1.0	0.0
TOC (mg/L)	2	1.6	6.3	3.9	3.9	3.3
Chlorides (mg/L)	3	4.9	7.8	5.5	6.0	1.5
Biological						
Chlorophyll a (µg/L)	5	< 0.53	1.60	0.53	0.85	0.48
^J Fecal Coliform (col/100 mL)	3	87	120	93	100	18

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