

2008 Monitoring Summary



Ambient Monitoring Site

Styx River at Baldwin County Road 87 (30.60532/-87.54700)

BACKGROUND

Styx River at STXB-3 is one of a network of 106 ambient sites monitored annually by the Alabama Department of Environmental Management (ADEM) to identify long-term trends in water quality and to provide data for the development of Total Maximum Daily Loads (TMDL) and water quality criteria.

Styx River was also selected for biological and water quality monitoring as part of the 2008 Assessment of the Southeast Alabama (SE AL) River Basins. The objectives of the SE AL Basin Assessments were to assess the biological integrity of each monitoring site and to estimate overall water quality within the SE AL basin group.

Styx River was placed on Alabama's §303(d) list of impaired water bodies in 2002 for metals contamination (Mercury) from atmospheric deposition. A draft TMDL is scheduled for completion in 2011.



Figure 1. Downstream-view of Styx River at STXB-3, May 5, 2010.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Styx River is a *Fish & Wildlife (F&W)* stream located within the *Southern Pine Plains and Hills* sub-ecoregion. It drains approximately 191 mi² in Baldwin County before its confluence with Perdido River. Based on the 2006 National Land Cover Dataset, landuse within the watershed is mainly forest (66%). Population density is relatively low and less than 7% of the area has been developed. As of May 13, 2013, there are 70 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 in Styx River at STXB-3. Instream substrates were dominated by sand and the gradient at the reach was low (Figure 1). Overall habitat quality was categorized as *sub-optimal* for supporting macroinvertebrate populations due to lack of instream habitat (e.g. root banks, submerged logs), a thin riparian buffer zone (increases sediment loads), and a relatively straight channel (leads to habitat destruction during high flow events).

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 metric scores. Metric results indicated the macroinvertebrate community in Styx River at STXB-3 to be in *good* condition (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Perdido River
Drainage Area (mi²)		191
Ecoregion^a		65f
% Landuse		
Open water		<1
Wetland	Woody	3
	Emergent herbaceous	<1
Forest	Deciduous	2
	Evergreen	57
	Mixed	7
Shrub/scrub		10
Grassland/herbaceous		<1
Pasture/hay		5
Cultivated crops		11
Development	Open space	4
	Low intensity	1
	Moderate intensity	<1
	High intensity	<1
Population/km^{2b}		18
# NPDES Permits^c	TOTAL	70
	401 Water Quality Certification	2
	Coastal Certification	1
	Construction Stormwater	56
	Mining	2
	Industrial General	1
	Industrial Individual	4
	Municipal Individual	4

a. Southern Pine Plains & Hills

b. 2000 US Census

c. #NPDES permits downloaded from ADEM's NPDES Management System database, May 13, 2013

Table 2. Physical characteristics of Styx River at STXB-3, May 13, 2008.

Physical Characteristics		
Width (ft)		100
Canopy cover		Open
Depth (ft)	Run	2.0
	Pool	3.0
% of Reach	Run	60
	Pool	40
% Substrate	Gravel	2
	Sand	90
	Silt	3
	Organic Matter	5

Table 3. Results of the habitat assessment conducted in Styx River at STXB-3, May 13, 2008.

Habitat Assessment	(% Maximum Score)	Rating
Instream Habitat Quality	46	Marginal (40-52)
Sediment Deposition	66	Optimal >65
Sinuosity	60	Marginal (45-64)
Bank and Vegetative Stability	63	Sub-optimal (60-74)
Riparian Buffer	61	Marginal (50-69)
Habitat Assessment Score	133	
% Maximum Score	60	Sub-optimal (53-65)

Table 4. Results of the macroinvertebrate bioassessment conducted in Styx River at STXB-3, May 13, 2008.

Macroinvertebrate Assessment		
	Results	Scores (0-100)
Taxa richness measures		
# EPT genera	19	76
Taxonomic composition measures		
% Non-insect taxa	10	77
% Plecoptera	3	14
% Dominant taxa	13	92
Functional feeding group measures		
% Predators	24	83
Tolerance measures		
Beck's community tolerance index	14	64
% Taxa as Tolerant	26	73
WMB-I Assessment Score	--	69
WMB-I Assessment Rating		Good

WATER CHEMISTRY

Results of water chemistry are presented in Table 5. In situ measurements were collected during water sampling in June, August, and October and during the macroinvertebrate assessment in May 2008 to help identify any stressors to the biological communities. Styx River at STXB-3 met *F&W* use classification criteria for temperature, turbidity, and dissolved oxygen. One of four pH measurements was below the 6.0 standard unit criteria for *F&W*. However, a slightly acidic pH is not unusual in this stream type. Median specific conductance was higher than expected for the ecoregion, based on the median value of all samples collected at least impaired reference reaches. Also, median nitrogen concentrations (nitrate-nitrite nitrogen and total nitrogen) were higher than anticipated. No metals, pesticides, atrazine, or semi-volatile organics samples were collected.

SUMMARY

The habitat at Styx River at STXB-3 was assessed and found to be *sub-optimal* in its ability to support healthy and diverse macroinvertebrate communities. However, the overall macroinvertebrate community condition was rated as *good*. Nitrate-nitrite nitrogen and total nitrogen, as well as specific conductance values were higher than expected for the ecoregion.

Table 5. Summary of water quality data collected during 2008. 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	Med	Avg	SD	E
Physical							
Temperature (°C)	4	20.8	27.0	23.2	23.6	2.6	
Turbidity (NTU)	4	2.3	5.5	4.2	4.0	1.6	
Total Dissolved Solids (mg/L)	3	32.0	33.0	33.0	32.7	0.6	
Total Suspended Solids (mg/L)	3	< 5.0	6.0	5.0	4.5	1.8	
Specific Conductance (µmhos)	4	33.4	35.2	34.6 ^G	34.4	0.8	
Hardness (mg/L)	3	7.0	10.0	7.0	8.0	1.7	
Alkalinity (mg/L)	3	3.0	23.0	6.0	10.7	10.8	
Stream Flow (cfs)	4	91.0	147.0	103.5	111.2	24.8	
Chemical							
Dissolved Oxygen (mg/L)	4	8.0	8.8	8.6	8.5	0.4	
pH (su)	4	5.3 ^C	6.8	6.2	6.1	0.6	1
Ammonia Nitrogen (mg/L)	3	< 0.010	0.050	0.005	0.020	0.026	
Nitrate+Nitrite Nitrogen (mg/L)	3	0.418	0.533	0.510 ^M	0.487	0.061	
Total Kjeldahl Nitrogen (mg/L)	3	0.240	0.440	0.300	0.327	0.103	
Total Nitrogen (mg/L)	3	0.750	0.858	0.833 ^M	0.814	0.056	
Dissolved Reactive Phosphorus (mg/L)	3	0.006	0.014	0.006	0.009	0.005	
Total Phosphorus (mg/L)	3	0.012	0.017	0.014	0.014	0.002	
^J CBOD-5 (mg/L)	3	< 1.0	1.2	0.5	0.7	0.4	
Chlorides (mg/L)	3	< 6.0	< 6.0	3.0	3.0	0.0	
Biological							
Chlorophyll a (ug/L)	3	< 1.00	1.60	0.50	0.87	0.64	
^J Fecal Coliform (col/100 mL)	3	12	1,200	26	413	682	

C=*F&W* criterion exceeded; E=# of samples that exceeded criterion; G=value > median of all reference reach data collected; J=estimate; M=value>90% of all verified ecoregional reference reach data collected in sub-ecoregion 65f; N=# of samples;

FOR MORE INFORMATION, CONTACT:

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