

2006 Monitoring Summary



Swan Creek at Hwy 72 near Athens in Limestone County (34.78497/-86.94780)

BACKGROUND

Swan Creek is classified for *Agriculture & Industry (A&I)* uses from County Road 24 upstream to its confluence with Town Creek. As mandated by the Clean Water Act (CWA), the Alabama Department of Environmental Management (ADEM) conducted a Use Attainability Analysis (UAA) study to determine if the reach could reasonably be expected to attain water quality criteria consistent with ADEM's Fish & Wildlife (F&W) use classification, which achieves the CWA interim "fishable/swimmable" goal.

As part of this effort, the ADEM conducted habitat and macroinvertebrate assessments of Swan Creek at State Hwy 72 (SWNL-392), upstream of Town Creek and the A&I listed segment of Swan Creek.



Figure 1. Swan Creek at SWNL-392, just upstream of Hwy 72.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Swan Creek (Fig. 1) is located in the Eastern Highland Rim ecoregion. Landuse within the watershed was primarily pasture with some forested areas. As of June 9, 2008, ADEM had issued thirty-five NPDES permits in this watershed, of which 30 were for preconstruction activities.

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. Swan Creek at SWNL-392 is a riffle-run stream characterized by bedrock substrate (Figure 1). Overall habitat quality was categorized as *optimal*. However, evidence of historical channelization and on-going sedimentation were noted.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		Tennessee River
Basin		30
Drainage Area (mi ²)		71g
Ecoregion ^a		
% Landuse		
Open water		<1
Wetland	Woody	3
	Emergent herbaceous	<1
Forest	Deciduous	15
	Evergreen	4
	Mixed	6
Shrub/scrub		5
Grassland/herbaceous		2
Pasture/hay		38
Cultivated crops		11
Development	Open space	9
	Low intensity	5
	Moderate intensity	1
	High intensity	<1
Barren		<1
Population/km ^{2b}		96
# NPDES Permits ^c	TOTAL	70
	Construction Stormwater	58
	Industrial General	8
	Industrial Individual	1
	Municipal Individual	3

a. Eastern Highland Rim of the Interior Plateau

b. 2000 US Census

c. #NPDES permits downloaded from ADEM's NPDES Management System database, 9 Jun 2008

Table 2. Physical characteristics of Swan Ck at SWNL-392, June 07, 2006.

Physical Characteristics	
Canopy Cover	Mostly Shaded
Depth (Ft)	
	Riffle 0.3
	Run 1.5
	Pool 3.0
% of Reach	
	Riffle 15
	Run 35
	Pool 50
% Substrate	
	Bedrock 55
	Boulder 10
	Cobble 15
	Gravel 15
	Sand 3
	Organic Matter 2

BIOASSESSMENT RESULTS

Benthic macroinvertebrate communities were sampled using ADEM's [Intensive Multi-habitat Bioassessment Methodology \(WMB-I\)](#). The WMB-I measures 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 an average of the score for each metric. Results indicated the macroinvertebrate community to be in *poor* condition (Table 4).

Table 3. Results of the habitat assessment conducted on Swan Creek at SWNL-392, June 7, 2006.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	66	Sub-optimal (59-70)
Sediment Deposition	83	Optimal >70
Sinuosity	88	Optimal >84
Bank and Vegetative Stability	73	Sub-optimal (60-74)
Riparian Buffer	84	Sub-optimal (70-89)
Habitat Assessment Score	186	
% Maximum Score	78	Optimal >70

Table 4. Results of macroinvertebrate assessment conducted June 7, 2006.

Macroinvertebrate Assessment			
	Result	Scores (0-100)	Rating
Taxa richness measures			
# Ephemeroptera (mayfly)	4	33	Poor (23-46)
# Plecoptera (stonefly) genera	0	0	Very Poor (<16)
# Trichoptera (caddisfly) genera	6	50	Fair (45-66)
Taxonomic composition			
% Non-insect taxa	17	32	Poor (24.7-49.4)
% Non-insect organisms	3	92	Fair (62.8-93.9)
% Plecoptera	0	0	Very Poor
Tolerance measures			
Beck's community tolerance	5	18	Very Poor
WMB-I Assessment Score	-	32	Poor (24-48)

WATER CHEMISTRY

Results of water chemistry analyses are presented 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 to help identify any stressors to the biological communities. Median concentrations of chlorides and total aluminum were higher than expected based on the 90th percentile of data collected at reference reaches within the Interior Plateau Ecoregion. Conductivity was also higher than expected. Stream pH exceeded *F&W* use classification criteria during four of nine sampling events.

SUMMARY

Bioassessment results indicated the macroinvertebrate community in Swan Creek at SWNL-390 to be in *poor* condition. Results of other data collected during 2006 suggested nutrient metals and sedimentation to be potential causes of the deteriorated biological conditions.

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Table 5. Summary of water quality data collected March-October, 2006. 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. Metals results were compared to ADEM's chronic aquatic life use criteria adjusted for hardness.

Parameter	N	Min	Max	Med	Avg	SD	Q
Physical							
Temperature (°C)	9	10.6	25.7	22.0	20.1	4.9	
Turbidity (NTU)	9	1.2	7.2	3.5	4.0	1.8	
Total Dissolved Solids (mg/L)	8	75.0	196.0	109.0	113.4	40.6	
Total Suspended Solids (mg/L)	8	1.0	5.0	2.5	2.6	1.4	
Specific Conductance (µmhos)	9	102.0	225.0	202.0 ^M	174.4	49.8	
Hardness (mg/L)	3	52.1	55.0	52.4	53.2	1.6	
Alkalinity (mg/L)	8	40.0	96.0	84.1	72.9	24.4	
Stream Flow (cfs)	8	2.1	54.2	4.8	14.2	18.1	
Chemical							
Dissolved Oxygen (mg/L)	9	6.1	12.2	9.3	9.3	2.1	
pH (su)	9	7.7	8.3	7.9	7.9	0.2	
Ammonia Nitrogen (mg/L)	8	< 0.015	0.135	0.008	0.029	0.045	
Nitrate+Nitrite Nitrogen (mg/L)	8	0.481	1.528	0.978	0.964	0.353	
Total Kjeldahl Nitrogen (mg/L)	8	0.252	0.574	0.412	0.408	0.102	
Total Nitrogen (mg/L)	8	0.740	2.026	1.388	1.372	0.408	
Dissolved Reactive Phosphorus (mg/L)	8	0.004	0.012	0.006	0.007	0.003	
Total Phosphorus (mg/L)	8	< 0.100	0.100	0.050	0.050	0.000	
CBOD-5 (mg/L)	8	0.3	2.3	0.5	0.9	0.7	
Chlorides (mg/L)	8	3.9	6.3	4.5 ^M	4.6	0.8	
Total Metals							
Aluminum (mg/L)	3	0.085	0.233	0.155 ^M	0.158	0.074	
Iron (mg/L)	3	0.253	0.626	0.288	0.389	0.206	
Manganese (mg/L)	3	< 0.050	0.050	0.025	0.025	0.000	
Dissolved Metals							
Aluminum (mg/L)	3	< 0.050	0.059	0.025	0.036	0.020	
Antimony (µg/L)	3	< 10.0	10.0	5.0	5.0	0.0	
Arsenic (µg/L)	3	< 10.0	10.0	5.0	5.0	0.0	
Cadmium (mg/L)	3	< 0.015	0.015	0.008	0.008	0.000	
Chromium (mg/L)	3	< 0.050	0.050	0.025	0.025	0.000	
Copper (mg/L)	3	< 0.050	0.050	0.025	0.025	0.000	
Iron (mg/L)	3	0.122	0.290	0.124	0.179	0.096	
Lead (µg/L)	3	< 10.0	10.0	5.0	5.0	0.0	
Manganese (mg/L)	3	< 0.020	0.020	0.010	0.010	0.000	
Mercury (µg/L)	1				0.4		
Nickel (mg/L)	3	< 0.050	0.050	0.025	0.025	0.000	
Selenium (µg/L)	3	< 50.0	50.0	25.0	25.0	0.0	
Silver (mg/L)	3	< 0.0	0.0	0.0	0.0	0.0	
Thallium (µg/L)	3	< 10.0	10.0	5.0	5.0	0.0	
Zinc (mg/L)	3	< 0.050	0.050	0.025	0.025	0.000	
Biological							
Chlorophyll a (ug/L)	8	< 1.00	2.24	1.20	1.20	0.68	
Fecal Coliform (col/100 mL)	7	5	136	92	73	54	J

J = estimate; N = # samples; M = value > 90th percentile of all verified ecoregional reference reach data collected within eco-region 71; C = value exceeds established criteria for *A&I* water use classification.