Alabama Department of Environmental Management

§303(d)/TMDL Monitoring Site

Rivers and Streams Monitoring Program

2013 Monitoring Summary

Very Poor

Swan Creek at the L&N Railroad Crossing in Limestone County (34.68372/-86.97067)

BACKGROUND

Swan Creek, from its confluence with the Tennessee River to Brown's Ferry Road, has been on Alabama's Clean Water Act (CWA) §303(d) list of impaired waters since 2008. It is listed for nutrients from agricultural and municipal sources. In 2013, the Alabama Department of Environmental Management (ADEM) selected the Swan Creek watershed as part of the 2013 Tennessee River Basin Assessment Plan. The 2013 data will be used to assess the biological integrity of the site, develop Total Maximum Daily Loads (TMDL's), and estimate overall water quality within the Tennessee River Basin. As part of this effort, habitat and macroinvertebrate assessments were conducted in Swan Creek at SWNL-380 on June 3, 2013.

Figure 1. Swan Creek at SWNL-380, June 3, 2013.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Swan Creek at SWNL-380 is a *Fish and Wildlife (F&W)* stream in Limestone County. Based on the 2006 National Land Cover Dataset, landuse within the watershed is primarily pasture and crops (48%), with some lightly developed areas (22%) and forest (18%). As of May 13, 2013, ADEM's NPDES Management System database showed 36 permitted discharges within the watershed, with almost half being 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 Eastern Highland Rim 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-380 is a low-gradient, glide-pool stream characterized primarily by a gravel and cobble substrate (Figure 1). Overall habitat quality was categorized as *marginal.*

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 the average of all individual metric scores. Metric results indicated the macroinvertebrate community at SWNL-380 to be in *very poor* condition (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Tennessee River
Drainage Area (mi^2)		54
Ecoregion[a]		71g
% Landuse		
Open water		<1
Wetland	Woody	4
	Emergent herbaceous	<1
Forest	Deciduous	11
	Evergreen	3
	Mixed	4
Shrub/scrub		5
Grassland/herbaceous		2
Pasture/hay		32
Cultivated crops		16
Development	Open space	11
	Low intensity	9
	Moderate intensity	2
	High intensity	<1
Barren		<1
Population/km^2[b]		143
# NPDES Permits[c]	**TOTAL**	36
Construction Stormwater		15
Industrial General		14
Industrial Individual		2
Underground Injection Control		5

a. Eastern Highland Rim

b. 2000 US Census

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

Table 2. Physical characteristics of Swan Creek at SWNL-380, June 3, 2013.

Physical Characteristics		
Width (ft)		65
Canopy Cover		Open
Depth (ft)		
	Run	1.0
	Pool	1.5
% of Reach		
	Run	90
	Pool	10
% Substrate		
	Boulder	2
	Cobble	30
	Mud/Muck	2
	Gravel	50
	Sand	10
	Silt	3
	Organic Matter	3

Table 3. Results of the habitat assessment conducted on Swan Creek at SWNL-380, June 3, 2013.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	49	Marginal (41-58)
Sediment Deposition	53	Marginal (41-58)
Sinuosity	15	Poor (<45)
Bank and Vegetative Stability	70	Sub-optimal (60-74)
Riparian Buffer	78	Sub-optimal (70-89)
Habitat Assessment Score	**129**	
% Maximum Score	**58**	**Marginal (41-58)**

Table 4. Results of the macroinvertebrate bioassessment conducted in Swan Creek at SWNL-380, June 3, 2013.

Macroinvertebrate Assessment		
	Results	**Scores**
Taxa richness and diversity measures		**(0-100)**
# EPT taxa	7	13
Shannon Diversity	3.08	18
Taxonomic composition measures		
% EPT minus Baetidae and Hydropsychidae	1	1
% Non-insect taxa	27	0
Functional feeding group		
% Predator Individuals	6	18
Community tolerance		
% Tolerant taxa	37	35
WMB-I Assessment Score	**---**	**14**
WMB-I Assessment Rating		**Very Poor (0-14)**

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. In situ measurements and water samples were collected monthly from March through October 2013, to help identify any stressors to the biological communities. A 72-hour diurnal study was also conducted to measure dissolved oxygen levels, but all data from this study was discarded due to unacceptable flow conditions. Analyses indicate that the median concentrations of chlorides and nutrients (total Kjeldahl nitrogen, total nitrogen, dissolved reactive phosphorous, and total phosphorous) were elevated in comparison with the 90th percentile of data collected at reference reaches within the Eastern Highland Rim Ecoregion (71g). Median conductivity and temperature were also higher than expected for this ecoregion.

Table 5. Summary of water quality data collected during 2013. 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
Physical						
Temperature (°C)	9	6.5	27.0	23.8 M	20.0	6.7
Turbidity (NTU)	14	0.9	12.0	2.9	4.0	3.2
J Total Dissolved Solids (mg/L)	8	91.0	261.0	140.0	155.9	60.2
J Total Suspended Solids (mg/L)	8	1.0	4.0	3.0	2.8	1.3
Specific Conductance (µmhos)	9	146.0	360.0	214.0 G	220.0	70.8
J Alkalinity (mg/L)	8	31.8	117.9	53.9	64.5	32.0
Stream Flow (cfs)	11	9.8	170.5	42.8	60.7	51.1
Chemical						
Dissolved Oxygen (mg/L)	9	8.3	13.6	10.2	10.3	1.6
pH (su)	9	7.6	8.3	7.8	7.8	0.2
J Ammonia Nitrogen (mg/L)	8	< 0.010	0.170	0.009	0.040	0.057
J Nitrate+Nitrite Nitrogen (mg/L)	8	1.010	2.280	1.375	1.451	0.424
Total Kjeldahl Nitrogen (mg/L)	8	0.463	0.960	0.600 M	0.644	0.170
J Total Nitrogen (mg/L)	8	1.617	3.100	2.050 M	2.096	0.496
Dissolved Reactive Phosphorus (mg/L)	8	0.011	0.164	0.054 M	0.070	0.055
Total Phosphorus (mg/L)	8	0.027	0.173	0.067 M	0.092	0.055
J CBOD-5 (mg/L)	6	< 2.0	< 2.0	1.0	1.0	0.0
Chlorides (mg/L)	8	4.8	21.4	6.9 M	8.9	5.5
Biological						
Chlorophyll a (ug/L)	8	< 1.00	2.67	1.05	1.18	0.81

G=value higher than median concentration of all verified ecoregional reference reach data collected in the ecoregion 71g; J=estimate; M=value >90% of all verified ecoregional reference reach data collected in the ecoregion 71g; N=# samples.

SUMMARY

These data indicate that Swan Creek at SWNL-380 is currently maintaining Alabama's *F&W* use classification criteria. Bioassessment results indicated the macroinvertebrate community to be in *very poor* condition, with *marginal* habitat. Results of other data collected suggest stream temperature and conductivity, along with nutrient enrichment, to be potential causes of the degraded biological condition.

FOR MORE INFORMATION, CONTACT:
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