ADEM
Alabama Department of Environmental Management

Rivers and Streams Monitoring Program

Ecological Reference Reach Site

2010 Monitoring Summary

™

Good

Swift Creek at Chilton County Road 24 near Billingsley (32.72144/-86.69159)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) monitors Swift Creek as a "best attainable condition" reference watershed for comparison with streams throughout the Fall Line Hills ecoregion. Swift Creek at SWFC-1 is among the least-disturbed watersheds in the Alabama, Coosa, Tallapoosa (ACT) basin group based on landuse, road density, and population density. The objective of the study is to collect data to develop water quality criteria and TMDLs.

Swift Creek was also selected for biological and water quality monitoring as part of the 2010 Alabama, Coosa, and Tallapoosa (ACT) Basin Assessment Monitoring. The objective of the study was to assess the biological integrity of each monitoring location and to estimate overall water quality within the basin.

Figure 1. Swift Creek at SWFC-1, December 1, 2010.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Swift Creek from Alabama River to its source is designated as a *Swimming/Fish & Wildlife (S/F&W) s*tream, located in the Fall Line Hills ecoregion (65i). Based on the 2006 National Land Cover Dataset, land cover within the watershed is mainly forest (55%), followed by shrubs/scrub, and pasture/hay. Swift Creek watershed has a low population density. As of May 13, 2013, there are no NPDES 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, this information can give an indication of physical condition and the availability and quality of habitat. Swift Creek at SWFC-1 (Figure 1) is sand bottomed stream with small gravel riffles, leaf packs and snags that provide moderately stable habitat for biological communities. Overall habitat quality was categorized as *sub-optimal* for supporting macroinvertebrate communities.

BIOASSESSMENTS

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 metric scores. The final score indicated the biological community to be in *good* condition (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Alabama River
Drainage Area (mi^2)		24
Ecoregion[a]		65i
% Landuse		
Open water		<1
Wetland	Woody	2
	Emergent herbaceous	<1
Forest	Deciduous	27
	Evergreen	13
	Mixed	15
Shrub/scrub		19
Grassland/herbaceous		<1
Pasture/hay		16
Cultivated crops		4
Development	Open space	3
	Low intensity	1
	Moderate intensity	<1
Population/km^2 [b]		17

a. Fall Line Hills
b. 2000 US Census

Table 2. Physical characteristics of Swift Creek at SWFC-1, May 12, 2010.

Physical Characteristics		
Canopy Cover		Mostly Shaded
Width (ft)		33
Depth (ft)		
	Riffle	0.6
	Run	1.0
	Pool	1.5
% of Reach		
	Riffle	10
	Run	85
	Pool	5
% Substrate		
	Cobble	5
	Gravel	21
	Sand	60
	Silt	2
Organic Matter		12

Table 3. Results of the habitat assessment conducted at Swift Creek at SWFC-1, May 12, 2010.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	56	Sub-optimal (53-65)
Sediment Deposition	50	Marginal (40-52)
Sinuosity	63	Marginal (45-64)
Bank and Vegetative Stability	65	Sub-optimal (60-74)
Riparian Buffer	90	Optimal >89
Habitat Assessment Score	**153**	
% Maximum Score	**64**	**Sub-optimal (53-65)**

Table 4. Results of the macroinvertebrate bioassessment conducted in Swift Creek at SWFC-1, May 12, 2010.

Macroinvertebrate Assessment	Results	Scores (0-100)
Taxa richness and diversity measures		
% EPC taxa	28	47
% Dominant Taxon	16	89
Taxonomic composition measures		
% EPT minus Baetidae and Hydropsychidae	38	69
Functional feeding group		
# Collector Taxa	20	65
Community tolerance		
% Nutrient Tolerant individuals	12	92
WMB-I Assessment Score	---	**72**
WMB-I Assessment Rating		**Good (48-74)**

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. *In situ* measurements and water samples were collected in July, August, October, and December, 2010 to help identify any stressors to the biological communities. *In situ* parameters were also collected during macroinvertebrate assessment. In situ measurements, dissolved solids, chlorides, metals, and most nutrients were within the expected range of reference reaches in the Fall Line Hills ecoregion. Samples were analyzed in April and August for pesticides, semi-volatile organics and atrazine and were below detection limits. However, specific conductance, hardness, and nitrite+nitrate nitrogen were higher than expected for streams located in ecoregion 65i.

SUMMARY

Bioassessment data indicated the macroinvertebrate community in Swift Creek at SWFC-1 to be in *good* condition. Overall habitat assessment was rated as *sub-optimal.* Results of intensive water quality sampling suggest specific conductivity, hardness, and nitrate+nitrite were of concern in Swift Creek at SWFC-1.

Table 5. Summary of water quality data collected April-December, 2010. 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	Q
Physical									
Temperature (°C)	6		9.9		24.8	18.3	17.8	4.9	
Turbidity (NTU)	7		4.3		22.3	10.3	10.5	6.0	
Total Dissolved Solids (mg/L)	4		10.0		40.0	17.0	21.0	13.7	J
Total Suspended Solids (mg/L)	4	<	1.0		24.0	7.0	9.6	10.2	
Specific Conductance (µmhos)	6		31.4		38.8	34.1 G	34.7	3.5	
Hardness (mg/L)	4		9.4		13.9	10.6 G	11.1	2.0	
Alkalinity (mg/L)	4		3.6		8.8	5.7	5.9	2.2	
Stream Flow (cfs)	6		3.4		30.9	19.0	17.4	12.7	
Chemical									
Dissolved Oxygen (mg/L)	6		7.7		10.4	8.8	8.8	1.0	
pH (su)	6		6.1		6.6	6.4	6.4	0.2	
Ammonia Nitrogen (mg/L)	4	<	0.021	<	0.021	0.010	0.010	0.000	
Nitrate+Nitrite Nitrogen (mg/L)	4		0.052		0.500	0.388 M	0.332	0.209	
Total Kjeldahl Nitrogen (mg/L)	4	<	0.080		0.322	0.148	0.164	0.146	
Total Nitrogen (mg/L)	4	<	0.092		0.822	0.536	0.496	0.302	
Dissolved Reactive Phosphorus (mg/L)	4		0.005		0.009	0.005	0.006	0.002	J
Total Phosphorus (mg/L)	4		0.013		0.038	0.021	0.023	0.012	
CBOD-5 (mg/L)	4	<	2.0		2.2	1.0	1.3	0.6	
COD (mg/L)	4	<	1.8		17.3	7.7	8.4	8.7	
TOC (mg/L)	2		1.7		4.4	3.1	3.1	1.9	
Chlorides (mg/L)	4		3.2		5.0	4.2	4.2	0.8	
Atrazine (µg/L)	2	<	0.02	<	0.02	0.01	0.01	0.00	
Total Metals									
Aluminum (mg/L)	4		0.062		0.499	0.326	0.304	0.182	J
Iron (mg/L)	4		0.413		0.951	0.766	0.724	0.227	
Manganese (mg/L)	4		0.034		0.152	0.076	0.084	0.049	J
Dissolved Metals									
Aluminum (mg/L)	4	<	0.033		0.078	0.019	0.033	0.030	J
Antimony (µg/L)	4	<	1.9	<	1.9	0.9	0.9	0.0	
Arsenic (µg/L)	4	<	2.1	<	2.1	1.0	1.0	0.0	
Cadmium (mg/L)	4	<	0.000		0.014	0.004	0.004	0.004	
Chromium (mg/L)	4	<	0.009		0.013	0.006	0.006	0.001	
Copper (mg/L)	4	<	0.013		0.020	0.008	0.008	0.002	
Iron (mg/L)	4	<	0.026		0.188	0.070	0.086	0.087	J
Lead (µg/L)	4	<	1.7	<	1.7	0.8	0.8	0.0	
Manganese (mg/L)	4	<	0.001		0.116	0.012	0.035	0.055	J
Mercury (µg/L)	4	<	0.1	<	0.1	0.0	0.0	0.0	
Nickel (mg/L)	4	<	0.019		0.042	0.015	0.015	0.007	
Selenium (µg/L)	4	<	1.7		2.3	0.8	1.2	0.7	J
Silver (mg/L)	4	<	0.001		0.002	0.001	0.001	0.000	
Thallium (µg/L)	4	<	0.6	<	0.6	0.3	0.3	0.0	
Zinc (mg/L)	4	<	0.012		0.030	0.010	0.010	0.005	
Biological									
Chlorophyll a (ug/L)	4	<	0.10		0.53	0.05	0.17	0.24	
E. coli (col/100mL)	4		225		2420	390	856	1046	J

G=value higher than median concentration of all verified ecoregional reference reach data collected in the ecoregion 65i; J=estimate; M= value >90% all verified ecoregional reference reach data collected in the ecoregion 65i; N= # samples; Q=qualifier.