

2010 Monitoring Summary



Silver Creek in Clarke County (31.69517/-87.58156)

BACKGROUND

Silver Creek is one of the streams the Alabama Department of Environmental Management (ADEM) monitors as a “best attainable condition” reference watershed for comparison with streams throughout the Buhrstone/Lime Hills ecoregion (65q).

Additionally, Silver Creek was selected for biological and water quality monitoring as part of the 2010 Assessment of the Alabama, Coosa, and Tallapoosa River Basins. The objectives of the project were to assess the biological integrity of each monitoring site and to estimate overall water quality within the basin.



Figure 1. Silver Creek at SRC-1 April 15, 2010.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Silver Creek at SRC-1 is a *Fish & Wildlife (F&W)* stream located in Clarke County. Based on the 2006 National Land Cover Dataset, land cover within the watershed is mainly forest (95%) (Table 1). As of September 1, 2012, ADEM’s NPDES Management System database shows a total of two permitted discharges within the watershed.

REACH CHARACTERISTICS

General observations (Table 2) and a habitat assessment (Table 3) were completed during the macroinvertebrate assessment. Silver Creek at SRC-1 (Figure 1) is a riffle-run stream characterized by sand and gravel substrates. Overall habitat quality was categorized as *sub-optimal*.

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 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) and characteristic of forested reference reaches in the Buhrstone/Lime Hills ecoregion.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Alabama River
Drainage Area (mi²)		24
Ecoregion^a		65q
% Landuse		
Open water		<1
Wetland	Woody	1
Forest	Deciduous	11
	Evergreen	71
	Mixed	12
Shrub/scrub		3
Grassland/herbaceous		<1
Pasture/hay		1
Cultivated crops		<1
Development	Open space	1
	Low intensity	<1
	Moderate intensity	<1
Population/km^{2b}		1
# NPDES Permits^c	TOTAL	2
Construction Stormwater		2

a. Buhrstone/Lime Hills

b. 2000 US Census

c. #NPDES permits downloaded from ADEM’s NPDES Management System database, September 1, 2012.

Table 2. Physical characteristics of Silver Creek at SRC-1, May 11, 2010.

Physical Characteristics		
Width (ft)		35
Canopy Cover		Mostly Shaded
Depth (ft)	Riffle	0.4
	Run	1.0
	Pool	1.5
% of Reach	Riffle	15
	Run	75
	Pool	10
% Substrate	Boulder	1
	Cobble	4
	Gravel	22
	Sand	65
	Silt	3
	Organic Matter	5

Table 3. Results of the habitat assessment conducted on Silver Creek at SRC-1, May 11, 2010.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	59	Sub-optimal (53-65)
Sediment Deposition	57	Sub-optimal (53-65)
Sinuosity	70	Sub-optimal (65-84)
Bank and Vegetative Stability	49	Marginal (35-59)
Riparian Buffer	71	Sub-optimal (70-89)
Habitat Assessment Score	141	
% Maximum Score	59	Sub-optimal (53-65)

Table 4. Results of the macroinvertebrate bioassessment conducted in Silver Creek at SRC-1, May 11, 2010.

Macroinvertebrate Assessment		
	Results	Scores (0-100)
Taxa richness and diversity measures		
% EPC taxa	42	89
% Dominant Taxon	28	54
Taxonomic composition measures		
% EPT minus Baetidae and Hydropsychidae	9	15
Functional feeding group		
# Collector Taxa	24	85
Community tolerance		
% Nutrient Tolerant individuals	34	53
WMB-I Assessment Score	---	59
WMB-I Assessment Rating		Good (48-74)

WATER CHEMISTRY

Results of water chemistry are presented in Table 5. In situ measurements were collected each visit, water samples (nutrients and metals) semi-monthly, or twice (pesticides, atrazine, and semi-volatile organics) during April through October of 2010 to help identify any stressors to the biological communities.

Specific conductance and hardness were higher than expected based on median of eco-reference data. The median concentration of alkalinity and nitrate+nitrite was higher than expected for the Buhrstone/lime Hills ecoregion. Median concentrations of the metals that were detected (total aluminum, iron, manganese and dissolved aluminum, iron, manganese and mercury) were below concentrations of 90th percentile of verified ecoregional reference reach samples. Dissolved mercury was above aquatic life use and human health criteria for F&W use on April 15th.

SUMMARY

Bioassessment results indicated the macroinvertebrate community in Silver Creek at SRC-1 to be in *good* condition. The habitat assessment score was *sub-optimal*, concentrations of dissolved mercury were elevated on one occasion and median concentrations of alkalinity, specific conductance and nitrate+nitrite were higher than expected. Additionally, sand comprised sixty-five percent of the stream reach.

Table 5. Summary of water quality data collected April-October, 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	E
Physical							
Temperature (°C)	5	14.7	25.9	19.5	20.0	5.3	
Turbidity (NTU)	5	2.8	7.5	4.0	4.6	1.8	
Total Dissolved Solids (mg/L)	4	66.0	88.0	79.0	78.0	9.1	
Total Suspended Solids (mg/L)	4 <	5.0	6.0	2.5	3.4	1.8	
Specific Conductance (µmhos)	5	88.9	117.0	102.7 ^G	103.1	12.8	
Hardness (mg/L)	4	40.8	48.6	45.8 ^G	45.2	3.5	
Alkalinity (mg/L)	4	35.0	48.0	45.5 ^M	43.5	5.9	
Stream Flow (cfs)	5	2.7	25.8	13.3	13.6	10.2	
Chemical							
Dissolved Oxygen (mg/L)	5	8.0	10.5	9.0	9.1	1.0	
pH (su)	5	6.8	7.6	7.4	7.2	0.3	
Ammonia Nitrogen (mg/L)	4 <	0.029 <	0.029	0.014	0.014	0.000	
Nitrate+Nitrite Nitrogen (mg/L)	4	0.037	0.321	0.094 ^M	0.136	0.131	
^J Total Kjeldahl Nitrogen (mg/L)	4 <	0.070	0.340	0.175	0.181	0.125	
^J Total Nitrogen (mg/L)	4 <	0.084	0.481	0.353	0.318	0.168	
^J Dissolved Reactive Phosphorus (mg/L)	4 <	0.004	0.009	0.006	0.006	0.003	
^J Total Phosphorus (mg/L)	4	0.007	0.015	0.012	0.011	0.003	
^J CBOD-5 (mg/L)	4 <	1.0 <	1.0	0.5	0.5	0.0	
COD (mg/L)	2	7.0	12.0	9.5	9.5	3.5	
TOC (mg/L)	3	1.4	1.9	1.8	1.7	0.3	
Chlorides (mg/L)	4 <	0.6 <	0.6	0.3	0.3	0.0	
Atrazine (µg/L)	2 <	0.02 <	0.02	0.01	0.01	0.00	
Total Metals							
^J Aluminum (mg/L)	4	0.060	0.183	0.126	0.124	0.061	
^J Iron (mg/L)	4	0.503	0.866	0.617	0.651	0.156	
^J Manganese (mg/L)	4	0.018	0.046	0.028	0.030	0.012	
Dissolved Metals							
^J Aluminum (mg/L)	4 <	0.033	0.180	0.069	0.084	0.081	
^J Antimony (µg/L)	4 <	1.9 <	2.3	1.0	1.0	0.1	
^J Arsenic (µg/L)	4 <	1.9 <	2.1	1.0	1.0	0.0	
^J Cadmium (µg/L)	4 <	0.014 <	0.060	0.018	0.018	0.013	
^J Chromium (mg/L)	4 <	0.013 <	0.015	0.007	0.007	0.000	
^J Copper (mg/L)	4 <	0.013 <	0.014	0.007	0.007	0.000	
^J Iron (mg/L)	4	0.206	0.341	0.316	0.295	0.060	
^J Lead (µg/L)	4 <	1.7 <	2.6	1.1	1.1	0.3	
^J Manganese (mg/L)	4	0.016	0.039	0.024	0.026	0.010	
^J Mercury (µg/L)	4 <	0.080	0.159 ^{AH}	0.046	0.073	0.058	1
^J Nickel (mg/L)	4 <	0.009 <	0.019	0.007	0.007	0.003	
^J Selenium (µg/L)	4 <	0.8 <	1.7	0.8	0.8	0.3	
^J Silver (µg/L)	4 <	0.015 <	0.200	0.054	0.054	0.053	
^J Thallium (µg/L)	4 <	0.6 <	1.2	0.4	0.4	0.2	
^J Zinc (mg/L)	4 <	0.002 <	0.030	0.008	0.008	0.008	
Biological							
Chlorophyll a (µg/L)	4 <	1.00 <	1.00	0.50	0.50	0.00	
^J Fecal Coliform (col/100 mL)	2	110	150	130	130	28	
^J E. coli (col/100mL)	4	2	7	5	5	2	

A=F&W aquatic life use criterion exceeded; E=# samples that exceeded criteria; G= value higher than median concentration of all verified ecoregional reference reach data collected in the ecoregion 65q; H=F&W human health criterion exceeded; J=estimate; M=value >90% of all verified ecoregional reference reach data collected in the ecoregion 65q; N=# samples

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