Alabama Department of Environmental Management

Ecological Reference Reach

Rivers and Streams Monitoring Program

2005 Monitoring Summary

Fair

Silver Creek on private property 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 Burhstone/ Lime Hills ecoregion.

Additionally, Silver Creek was selected for biological and water quality monitoring as part of the 2005 Assessment of the Alabama, Coosa, and Tallapoosa (ACT) River Basins. The objectives of the ACT Basin Assessments were to assess the biological integrity of each site and to estimate overall water quality within the ACT basin group.

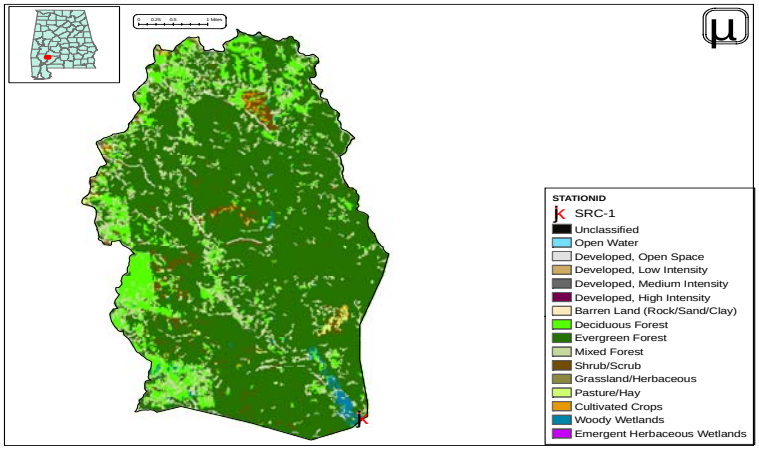

Figure 1. Sampling location and land use within the Silver Creek watershed at SRC-1.

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 (Fig. 1). It is located within the Burhstone/ Lime Hills ecoregion (65q). Landuse in the watershed is mainly forest (94%). Silviculture was also noted in the watershed.

REACH CHARACTERISTICS

General observations (Table 2) and habitat assessments (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. Silver Creek at SRC-1 is a low-gradient, mostly shaded stream characterized by sand and gravel bottom substrates and gravel riffles.The reach had evidence of some erosion. Overall habitat quality and availability was rated as *suboptimal* for supporting macroinvertebrate communities.

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 an average of all individual metric scores. The final score indicated the biological community at SRC-1 to be in *fair* condition (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Drainage Area (mi^2)		24
Ecoregion[a]		65q
% Landuse		
Open water		<1
Wetland	Woody	1
	Emergent herbaceous	
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^2[b]		8
# NPDES Permits[c]	**TOTAL**	2
Construction Stormwater		2

a.Burhstone/Lime Hills
b.2000 US Census
c.#NPDES permits downloaded from ADEM's NPDES Management System database, 9 Jun 2008

Table 2. Physical characteristics at SRC-1, May 24, 2005.

Physical characteristics		
Width (ft)		20
Canopy cover		Mostly Shaded
Depth (ft)		
	Riffle	0.5
	Run	0.8
	Pool	1.5
% of Reach		
	Riffle	5
	Run	75
	Pool	20
% Substrate		
	Cobble	2
	Gravel	35
	Sand	50
	Silt	5
	Organic Matter	8

Table 3. Results of habitat assessment conducted at SRC-1 on May 24, 2005.

Habitat Assessment (% Maximum Score)		Rating
Instream habitat quality	68	Optimal (>65)
Sediment deposition	58	Sub-optimal (53-65)
Sinuosity	60	Marginal (45-64)
Bank and vegetative stability	65	Sub-optimal (60-74)
Riparian buffer	65	Marginal (50-69)
Habitat assessment score	156	
% Maximum score	**65**	**Sub-optimal (53-65)**

Table 4. Results of macroinvertebrate assessment conducted at SRC-1, May 24, 2005.

Macroinvertebrate Assessment Results			
	Results	**Scores (0-100)**	**Rating**
Taxa richness measures			
# Ephemeroptera (mayfly) genera	10	83	Good (71-85)
# Plecoptera (stonefly) genera	3	50	Good (50-75)
# Trichoptera (caddisfly) genera	3	25	Poor (22-44)
Taxonomic composition measures			
% Non-insect taxa	5	81	Good (74.1-87.1)
% Non-insect organisms	0	99	Excellent (>97)
% Plecoptera	4	22	Good (19.7-59.8)
Tolerance measures			
Beck's community tolerance index	12	43	Fair (40.7-60.7)
WMB-I Assessment Score	**---**	**58**	**Fair (48-72)**

WATER CHEMISTRY

Results of water chemistry are presented in Table 5. 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 of 2005 to help identify any stressors to the biological communities. Median concentrations for all parameters were within expected ranges for streams in the Burhstone/ Lime Hills (65q) ecoregion.

CONCLUSIONS

ADEM has monitored Silver Creek at SRC-1 as a "best attainable" condition reference watershed since 2000. Landuse, road density, and population density categorize Silver Creek among the least-disturbed watersheds in the ACT basin group. Water quality data indicates the site to be typical of other reference reaches in the Burhstone/Lime Hills ecoregion. However, bioassessment results show the macroinvertebrate community to be in *fair* condition. Results of intensive water quality sampling and a habitat assessment suggest sedimentation and scouring to be potential sources of the lower biological conditions.

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Table 5. Summary of water quality data collected March-October, 2005. 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	Median	Avg	SD
Physical						
Temperature (°C)	8	17.5	27.0	20.9	21.7	3.1
Turbidity (NTU)	9	3.0	40.7	4.8	9.9	12.1
Total Dissolved Solids (mg/L)	7	20.0	109.0	73.0	74.6	30.4
Total Suspended Solids (mg/L)	7	3.0	56.0	7.0	14.4	18.8
Specific Conductance (µmhos)	8	56.9	110.9	79.6	81.2	19.3
Hardness (mg/L)	4	24.4	46.5	38.8	37.1	9.9
Alkalinity (mg/L)	7	21.4	40.9	32.3	30.6	7.7
Stream Flow (cfs)	9	9.2	85	19.8	29.0	---
Chemical						
Dissolved Oxygen (mg/L)	8	5.9	10.57	9.1	8.7	1.6
pH (su)	8	7.3	8.12	7.7	7.7	0.3
Ammonia Nitrogen (mg/L)	7	< 0.015	0.032	0.008	0.012	0.009
Nitrate+Nitrite Nitrogen (mg/L)	7	< 0.003	0.064	0.025	0.030	0.021
Total Kjeldahl Nitrogen (mg/L)	7	< 0.150	0.405	0.075	0.166	0.135
Total Nitrogen (mg/L)	7	0.089	0.407	0.139	0.196	0.128
Dissolved Reactive Phosphorus (mg/L)	7	< 0.004	0.021	0.011	0.012	0.008
Total Phosphorus (mg/L)	7	0.007	0.064	0.036	0.035	0.017
CBOD-5 (mg/L)	6	< 1.0	2.1	1.7	1.5	0.6
COD (mg/L)	1	< 2.0	2.0	1.0	1.0	0.0
[J] Chlorides (mg/L)	7	4.5	23.1	4.7	7.5	6.9
Atrazine (µg/L)	2	< 0.05	< 0.05	0.03	0.03	---
Total Metals						
Aluminum (mg/L)	4	< 0.015	0.602	0.008	0.156	0.297
Iron (mg/L)	4	0.508	2.13	0.621	0.970	0.779
Manganese (mg/L)	4	< 0.005	0.024	0.015	0.014	0.009
Dissolved Metals						
Aluminum (mg/L)	4	< 0.015	0.034	0.008	0.014	0.013
Antimony (µg/L)	4	< 2	< 2	1	1	0
Arsenic (µg/L)	4	< 10	< 10	5	5	0
Cadmium (mg/L)	4	< 0.005	< 0.005	0.003	0.003	0.000
Chromium (mg/L)	4	< 0.004	< 0.004	0.002	0.002	0.000
Copper (mg/L)	4	< 0.005	< 0.005	0.003	0.003	0.000
Iron (mg/L)	4	0.073	0.279	0.190	0.183	0.086
Lead (µg/L)	4	< 2	< 2	1	1	0
Manganese (mg/L)	4	< 0.005	0.014	0.003	0.005	0.006
Mercury (µg/L)	4	< 0.3	< 0.3	0.15	0.15	0.000
Nickel (mg/L)	4	< 0.006	< 0.006	0.003	0.003	0.000
Selenium (µg/L)	3	< 10	< 10	5	5	0
Silver (mg/L)	4	< 0.003	< 0.003	0.002	0.002	0.000
Thallium (µg/L)	4	< 1	< 1	0.5	0.5	0.0
Zinc (mg/L)	4	< 0.006	< 0.006	0.003	0.003	0.000
Biological						
[J] Chlorophyll a (µg/L)	7	0.53	11.75	1.07	3.36	4.05
[J] Fecal Coliform (col/100 mL)	6	38	440	155	176	151

J=estimate; N=number of samples