

2007 Monitoring Summary



Shades Creek at Jefferson County Road 6–Parkwood Drive (33.35528/-86.89056)

BACKGROUND

Shades Creek at SH-1A is [one of a network of 94 sites](#) monitored annually by the Alabama Department of Environmental Management (ADEM) to identify long-term trends in water quality and to provide data for the development of Total Maximum Daily Loads (TMDL) and water quality criteria.

Shades Creek was also selected for biological and water quality monitoring as part of the [2007 Assessment of the Black Warrior and Cahaba \(BWC\) River Basins](#). The objectives of the BWC Basin Assessments were to assess the biological integrity of each monitoring site and to estimate overall water quality within the BWC basin group.

Since 1996, Shades Creek from the Cahaba River to its source has been on Alabama's Clean Water Act (CWA) [§303\(d\) list](#) of impaired waters for not meeting its [Fish and Wildlife \(F&W\)](#) water use classification. It was listed for siltation, other habitat alteration, turbidity and pathogens. Sources of these impairments include collection system failure, hwy/road/bridge construction, land development, urban runoff/storm sewers, removal of riparian vegetation, bank/shoreline modification. The TMDL to address pathogens was finalized in 2003. The TMDL's for the other causes were finalized in 2006.



Figure 1. Shades Creek at SH-1A, May 11, 2010.

WATERSHED CHARACTERISTICS

Shades Creek is a [Fish & Wildlife \(F&W\)](#) stream located in Jefferson County. The Shades Creek watershed at SH-1A lies within the Southern Shale Valleys (67g) ecoregion. Based on the 2000 Land Cover Dataset, greater than half (55%) of the watershed is comprised of urban development. Forty-one percent of the watershed is forested. Population density is relatively high in this area. The ADEM has issued 241 NPDES permits, the majority of which are construction stormwater related. (Table 1)

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 and the quality and availability of habitat. Shades Creek at SH-1A is a riffle-run stream reach characterized by gravel and sand substrates (Figure 1). The presence of stable substrate and riffles within the stream reach categorized overall habitat quality as *sub-optimal* for a Shale Hills stream. Sediment deposition and sinuosity were issues within the stream reach, however.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Cahaba River
Drainage Area (mi ²)		45
Ecoregion ^a		67g
% Landuse		
Open water		<1
Wetland	Woody	<1
Forest	Deciduous	27
	Evergreen	9
	Mixed	5
Shrub/scrub		1
Grassland/herbaceous		1
Pasture/hay		1
Cultivated crops		<1
Development	Open space	23
	Low intensity	20
	Moderate intensity	9
	High intensity	3
Barren		<1
Population/km ^{2b}		279
# NPDES Permits ^c	TOTAL	241
401 Water Quality Certification		3
Construction Stormwater		200
Mining		1
Industrial General		18
Industrial Individual		6
Municipal Individual		9
Underground Injection Control		4

a. Southern Shale Valleys

b. 2000 US Census

c. #NPDES permits downloaded from ADEM's NPDES Management System database, Feb 23, 2011.

Table 2. Physical characteristics of Shades Ck at SH-1A, May 16, 2007.

Physical Characteristics		
Width (ft)	45	
Canopy Cover	Mostly Shaded	
Depth (Ft)		
	Riffle	0.8
	Run	1.5
	Pool	2.0
% of Reach		
	Riffle	25
	Run	45
	Pool	30
% Substrate		
	Bedrock	5
	Boulder	3
	Cobble	5
	Gravel	20
	Sand	40
	Silt	15
	Organic Matter	12

Table 3. Results of the habitat assessment conducted on Shades Creek at SH-1A, May 16, 2007.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	68	Sub-optimal (59-70)
Sediment Deposition	49	Marginal (41-58)
Sinuosity	53	Marginal (45-64)
Bank and Vegetative Stability	66	Sub-optimal (60-74)
Riparian Buffer	84	Sub-optimal (70-89)
Habitat Assessment Score	156	
% Maximum Score	65	Sub-optimal (59-70)

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 the average of all individual metric scores. The relatively low taxa richness of stoneflies, mayflies and caddisflies, pollution-intolerant groups, and high percent dominance of pollution-tolerant organisms indicated the macroinvertebrate community to be in *very poor* condition (Table 4).

Table 4. Results of macroinvertebrate bioassessment conducted at SH-1A, May 16, 2007.

Macroinvertebrate Assessment			
	Results	Scores	Rating
Taxa richness measures		(0-100)	
# Ephemeroptera (mayfly) genera	3	25	Poor (23-46)
# Plecoptera (stonefly) genera	0	0	Very Poor (<16)
# Trichoptera (caddisfly) genera	4	33	Poor (22-44)
Taxonomic composition measures			
% Non-insect taxa	17	33	Poor (24.7-49.4)
% Non-insect organisms	15	60	Poor (31.3-62.7)
% Plecoptera	0	0	Very Poor (<6.56)
Tolerance measures			
Beck's community tolerance index	1	4	Very Poor (<20.2)
WMB-I Assessment Score	--	22	Very Poor (<24)

WATER CHEMISTRY RESULTS

Results of water chemistry are presented in Table 5. [In situ measurements](#) and [water samples](#) were collected monthly during March through October of 2007 to help identify any stressors to the biological communities. Metals were collected in June. Dissolved arsenic concentrations exceeded the human health criterion for the consumption of fish. Dissolved mercury concentrations exceeded the chronic freshwater aquatic life use criterion. Median concentrations of total dissolved solids, hardness, specific conductance, and chlorides were above values expected within this ecoregion.

SUMMARY

Shades Creek was added to Alabama's 1996 CWA 303d list of impaired waters for not meeting its *F&W* use classification. It was listed for siltation, other habitat alteration, turbidity and pathogens from several urban sources.

Bioassessment results indicated the macroinvertebrate community to be in *very poor* condition, verifying biological impairment within Shades Creek. Sediment deposition noted during the 2007 habitat assessment support siltation as a cause of impairment within the reach. Additionally, Shades Creek is characterized by stream flows that rise and fall very quickly. Combined with the low sinuosity, this could increase scouring impacts to biological communities. Pathogens data presented in this report did not indicate pathogen impairment but more intensive monitoring may be needed. Data collected in 2007 suggest that total dissolved solids, hardness, dissolved arsenic and mercury, and chlorides may also be parameters of concern.

Table 5. Summary of water quality data collected March-October, 2007. 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)	13	7.7	26.1	19.7	18.0	6.4
Turbidity (NTU)	13	1.2	13.4	4.1	4.9	3.7
Total Dissolved Solids (mg/L)	12	128.0	300.0	204.5 ^M	205.6	53.6
Total Suspended Solids (mg/L)	12	<1.0	8.0	1.0	2.3	2.4
Specific Conductance (µmhos)	13	165.0	352.0	284.0 ^M	281.8	50.6
Hardness (mg/L)	12	83.4	156.0	127.0 ^G	123.8	21.6
Alkalinity (mg/L)	12	<1.0	152.2	107.2	104.7	41.2
Stream Flow (cfs)	8	7.0	57.5	16.4	22.2	17.0
Chemical						
Dissolved Oxygen (mg/L)	13	5.4	13.1	8.3	8.9	2.3
pH (su)	13	7.5	8.0	7.8	7.8	0.2
Ammonia Nitrogen (mg/L)	12	<0.015	0.110	0.008	0.025	0.038
Nitrate+Nitrite Nitrogen (mg/L)	12	<0.003	0.515	0.098	0.178	0.186
^J Total Kjeldahl Nitrogen (mg/L)	12	0.186	0.657	0.392	0.428	0.163
^J Total Nitrogen (mg/L)	12	<0.239	1.029	0.650	0.605	0.223
Dissolved Reactive Phosphorus (mg/L)	12	<0.004	0.021	0.005	0.007	0.006
^J Total Phosphorus (mg/L)	12	<0.008	0.148	0.039	0.043	0.036
CBOD-5 (mg/L)	12	<0.3	2.3	0.5	0.8	0.6
Chlorides (mg/L)	12	3.9	14.9	7.0 ^M	8.0	3.6
Total Metals						
Aluminum (mg/L)	1				<0.060	
Iron (mg/L)	1				0.139	
Manganese (mg/L)	1				0.063	
Dissolved Metals						
Aluminum (mg/L)	1				<0.050	
Antimony (µg/L)	1				<10	
Arsenic (µg/L)	1				1 ^H	
Cadmium (mg/L)	1				<0.015	
Chromium (mg/L)	1				<0.050	
Copper (mg/L)	1				<0.050	
Iron (mg/L)	1				<0.050	
Lead (µg/L)	1				<0.5	
Manganese (mg/L)	1				0.054	
Mercury (µg/L)	1				0.037 ^A	
Nickel (mg/L)	1				<0.050	
Selenium (µg/L)	1				<0.3	
Silver (mg/L)	1				<0.005	
Thallium (µg/L)	1				<0.7	
Zinc (mg/L)	1				<0.050	
Biological						
Chlorophyll a (µg/L)	12	<1.00	10.30	0.50	1.43	2.81
^J Fecal Coliform (col/100 mL)	12	10	124	49	50	37

A=F&W aquatic life use criterion exceeded; G=value higher than median concentration of all verified ecoregional reference reach data collected in the ecoregion 67g; H=F&W human health criterion exceeded; J=estimate; M=value >90% of all verified ecoregional reference reach data collected in the ecoregion 67g; N=# samples.

FOR MORE INFORMATION, CONTACT:

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