

2009 Monitoring Summary



Little Shades Creek at Cherry Tree Lane in Jefferson County (33.42114/-86.77599)

BACKGROUND

Little Shades Creek at LSDJ-1 was selected for a stream restoration project under a Clean Water Act (CWA) §319(h) nonpoint source grant, provided by the US Environmental Protection Agency Region 4 through the Alabama Department of Environmental Management (ADEM) §319 grant program. A Watershed Management Plan (WMP) was developed to address sediment issues within a 1900 ft. stream reach located in the city of Vestavia Hills. Increased development and impervious surfaces had increased the volume and velocity of stormwater entering Little Shades Creek. As part of the WMP, the channel was modified to restore the stream's sinuosity and re-establish a flood plain. The project was fully implemented in April 2010.

WMPs are developed and implemented to improve overall water quality within the impaired waterbody. The WMP plan for Little Shades Creek included installing a minimum of three appropriately sized stormwater wetlands. Enhancement of an existing constructed wetland was also completed to better manage nonpoint source stormwater runoff.

Macroinvertebrate samples and a habitat assessment were collected on June 2, 2009 to assess the biological integrity, to estimate overall water quality and to document pre-restoration conditions within Little Shades Creek at LSDJ-1.



Figure 1. Little Shades Creek at LSDJ-1 taken February 27, 2009.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Little Shades Creek is a *Fish & Wildlife (F&W)* stream located south of the city of Vestavia Hills in Jefferson County. Based on the 2006 National Landcover Dataset, landuse within the watershed is primarily developed (70%), with some forested areas (28%). As of September 1, 2012, the ADEM has issued 45 NPDES discharge permits 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, they give an indication of the physical condition of the site and the quality and availability of habitat. Little Shades Creek at LSDJ-1 is a shallow, riffle-run stream reach located in the Southern Sandstone Ridges (Figure 1). Overall habitat quality was categorized as *sub-optimal* for supporting diverse aquatic macroinvertebrate communities.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Cahaba River
Drainage Area (mi ²)		8
Ecoregion ^a		67h
% Landuse		
Open water		<1
Wetland	Woody	<1
Forest	Deciduous	17
	Evergreen	5
	Mixed	6
Shrub/scrub		<1
Grassland/herbaceous		<1
Pasture/hay		2
Cultivated crops		<1
Development	Open space	43
	Low intensity	23
	Moderate intensity	3
	High intensity	<1
Population/km ^{2b}		639
# NPDES Permits ^c	TOTAL	45
	Construction Stormwater	44
	Municipal Individual	1

a. Southern Sandstone Ridges

b. 2000 US Census

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

Table 2. Physical characteristics of Little Shades Creek at LSDJ-1, June 2, 2009.

Physical Characteristics		
Width (ft)		30.0
Canopy Cover		Mostly Shaded
Depth (ft)		
	Riffle	0.7
	Run	2.0
	Pool	2.5
% of Reach		
	Riffle	30
	Run	60
	Pool	10
% Substrate		
	Bedrock	10
	Boulder	25
	Cobble	35
	Gravel	13
	Sand	10
	Silt	2
	Organic Matter	5

Table 3. Results of the habitat assessment conducted on Little Shades Creek at LSDJ-1, June 2, 2009.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	77	Optimal >70
Sediment Deposition	57	Marginal (41-58)
Sinuosity	78	Sub-optimal (65-84)
Bank and Vegetative Stability	54	Marginal (35-59)
Riparian Buffer	30	Poor <50
Habitat Assessment Score	145	
% Maximum Score	60	Sub-optimal (59-70)

Table 4. Results of the macroinvertebrate bioassessment conducted at LSDJ-1, June 2, 2009.

Macroinvertebrate Assessment		
	Results	Scores
Taxa richness and diversity measures		(0-100)
# EPT taxa	8	17
Shannon Diversity	4	67
Taxonomic composition measures		
% EPT minus Baetidae and Hydropsychidae	23	50
% Non-insect taxa	13	48
Tolerance measures		
% Tolerant taxa	37	34
WMB-I Assessment Score	---	43
WMB-I Assessment Rating		Poor (23-46)

Table 5. Summary of water quality data collected March-October, 2009. Minimum (Min) and maximum (Max) values calculated using minimum detection limits (MDL) when results were less than this value for non-metals parameters. 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	14.1	26.6	20.7	20.0	4.4
Turbidity (NTU)	9	1.4	4.4	1.6	2.0	1.0
Total Dissolved Solids (mg/L)	8	145.0	191.0	165.0 ^M	166.6	19.0
Total Suspended Solids (mg/L)	8	<0.3	2.0	1.0	1.1	0.9
Specific Conductance (µmhos)	9	243.0	353.0	261.5 ^G	275.8	38.1
^J Alkalinity (mg/L)	8	73.1	143.0	106.5 ^M	106.0	26.5
Stream Flow (cfs)	8	2.3	10.3	7.6	6.9	2.6
Chemical						
Dissolved Oxygen (mg/L)	9	7.9	11.3	9.3	9.6	1.3
pH (su)	9	7.5	8.4	7.8	7.8	0.2
^B Ammonia Nitrogen (mg/L)	1				<0.006	
^{JB} Nitrate+Nitrite Nitrogen (mg/L)	7	0.427	3.785	1.898 ^M	1.720	1.209
^B Total Kjeldahl Nitrogen (mg/L)	1				0.207	
^B Total Nitrogen (mg/L)	1				1.750	
^{JB} Dissolved Reactive Phosphorus (mg/L)	7	<0.008	0.092	0.014	0.030	0.031
^B Total Phosphorus (mg/L)	1				0.013	
CBOD-5 (mg/L)	8	<1.0	<1.0	0.5	0.5	0.0
Chlorides (mg/L)	8	4.7	17.7	10.8 ^M	11.0	3.6

B= one or more samples excluded from calculations because they did not meet laboratory QC requirements; G=value > median of all ecoregional reference reach data collected in ecoregion 67h; J=estimate; N=# samples; M=value > 90th percentile of all data collected within eco-region 67h.

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. Metric results indicated the macroinvertebrate community to be in *poor* condition (Table 4).

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. When possible, in-situ measurements and water samples were collected monthly, March through October of 2009, to identify any stressors to the biological community.

Nutrient (ammonia nitrogen, total Kjeldahl nitrogen, total nitrogen, total phosphorus) data collected on September 16, 2009 were within the 90th percentile of data collected at reference reaches in ecoregion 67h. Total dissolved solids, alkalinity, nitrate+nitrite nitrogen, and chlorides were higher than the 90th percentile of data collected at reference reaches in ecoregion 67h. Specific conductance was higher than the median value of data collected at reference reaches in this ecoregion.

Summary

Macroinvertebrate samples and a habitat assessment were collected on June 2, 2009 to assess the biological integrity, to estimate overall water quality and to provide a pre-restoration reference to the condition of Little Shades Creek at LSDJ-1. Bioassessment results indicated the macroinvertebrate community to be in *poor* condition with the overall habitat quality being categorized as *sub-optimal*. Results of other data collected during 2009 suggest sedimentation to be a potential cause of the deteriorated biological conditions. Further sampling should be conducted to document any improvements resulting from the stream restoration completed in April 2010.

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