Alabama Department of Environmental Management

Basin Assessment Site

Rivers and Streams Monitoring Program

2009 Monitoring Summary

Fair

Brush Creek in Lauderdale County at County Road 63 (34.87397/-87.54540)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Brush Creek watershed for biological and water quality monitoring as part of the 2009 Tennessee (TN) River Basin Monitoring. The objectives of this project were to assess the biological integrity of each monitoring site and to estimate overall water quality within the Tennessee River Basin.

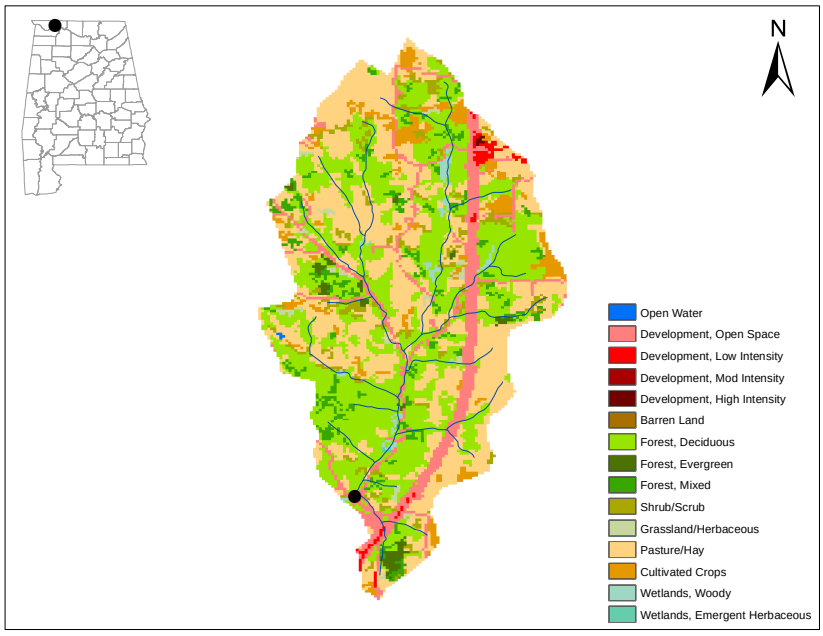

Figure 1. Sampling location and landuse within the Brush Creek watershed at BSHL-1.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Tennessee R
Drainage Area (mi^2)		5
Ecoregion[a]		71f
% Landuse		
Open water		<1
Wetland	Woody	1
Forest	Deciduous	37
	Evergreen	1
	Mixed	5
Shrub/scrub		4
Grassland/herbaceous		1
Pasture/hay		35
Cultivated crops		5
Development	Open space	11
	Low intensity	1
	High intensity	<1
Barren		37
Population/km^2[b]		4
# NPDES Permits[c]	**TOTAL**	7
Construction Stormwater		6
Industrial General		1

a. Western Highland Rim

b. 2000 US Census

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

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Brush Creek is a *Fish & Wildlife (F&W)* stream located near the city of Florence. Based on the 2006 National Land Cover Dataset, landuse within the watershed is primarily deciduous forest and pasture/hay (Figure 1). Population is low in the area. As of September 1, 2012, ADEM's NPDES Management System database shows a total of seven permitted discharges within the 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 conditions of the site and the quality and availability of habitat. Brush Creek at BSHL-1 is a riffle-run stream in the Western Highlands Rim ecoregion. Substrate within the reach is dominated by bedrock, gravel, and sand. Overall habitat quality was categorized as *optimal* for supporting aquatic 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 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 *fair* condition (Table 4).

Table 2. Physical characteristics of Brush Creek at BSHL-1, July 1, 2009.

Physical Characteristics		
Width (ft)		25
Canopy Cover		Shaded
Depth (ft)		
	Riffle	0.3
	Run	1.0
	Pool	1.5
% of Reach		
	Riffle	5
	Run	65
	Pool	30
% Substrate		
	Bedrock	30
	Boulder	2
	Cobble	10
	Mud/Muck	2
	Gravel	28
	Sand	20
	Silt	5
	Organic Matter	3

Table 3. Results of the habitat assessment conducted on Brush Creek at BSHL-1, July 1, 2009.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	72	Optimal >70
Sediment Deposition	69	Sub-optimal (59-70)
Sinuosity	73	Sub-optimal (65-84)
Bank and Vegetative Stability	68	Sub-optimal (60-74)
Riparian Buffer	78	Sub-optimal (70-89)
Habitat Assessment Score	**171**	
% Maximum Score	**71**	**Optimal >70**

Table 4. Results of the macroinvertebrate bioassessment conducted in Brush Creek at BSHL-1, July 1, 2009.

Macroinvertebrate Assessment		
	Results	**Scores**
Taxa richness and diversity measures		**(0-100)**
# EPT taxa	16	52
Shannon Diversity	3.15	21
Taxonomic composition measures		
% EPT minus Baetidae and Hydropsychidae	13	26
% Non-insect taxa	13	50
Functional feeding group		
% Predator Individuals	3	0
Community tolerance		
% Tolerant taxa	25	68
WMB-I Assessment Score	**---**	**33**
WMB-I Assessment Rating		**Fair (29-43)**

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. Samples were collected monthly, semi-monthly (metals), or quarterly (pesticides, atrazine, and semi-volatile organics) during March through October of 2009. Organics were collected at BSHL-1 on March 17th and July 8th. All parameters, with the exception of atrazine by immunoassay, were below detection limits. The dissolved arsenic concentration exceeded the criterion applicable to Brush Creek's *F&W* use classification in July. Dissolved reactive phosphorus and estimated concentrations of dissolved iron also appear to be elevated as compared to data from ADEM's least-impaired reference reaches in ecoregion 71.

SUMMARY

Bioassessment results indicated the macroinvertebrate community to be in *fair* condition. Overall habitat quality was categorized as *optimal* due to the availability of favorable substrate and instream cover. However, water chemistry results indicated high dissolved reactive phosphorus concentrations. Monitoring should continue to ensure that water quality and biological conditions remain stable. Additional low-level arsenic sampling may also be necessary to determine if the criterion exceedance is due to natural conditions or anthropogenic sources.

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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. 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)	9	9.2	23.4	20.8	18.6	4.7	
Turbidity (NTU)	9	2.4	4.6	3.7	3.7	0.8	
Total Dissolved Solids (mg/L)	8	30.0	55.0	39.5	41.9	8.8	
Total Suspended Solids (mg/L)	8	< 0.3	5.0	1.5	1.8	1.6	
Specific Conductance (µmhos)	9	53.3	63.0	58.0	58.0	3.6	
Hardness (mg/L)	4	15.5	24.3	21.6	20.7	3.8	
Alkalinity (mg/L)	8	3.5	28.0	19.5	19.5	8.2	
Stream Flow (cfs)	9	1.6	12.9	4.7	5.6	3.7	
Chemical							
Dissolved Oxygen (mg/L)	9	8.4	11.5	8.8	9.4	1.1	
pH (su)	9	7.2	7.7	7.4	7.5	0.2	
B Ammonia Nitrogen (mg/L)	3	< 0.006	< 0.006	0.003	0.003	0.000	
BJ Nitrate+Nitrite Nitrogen (mg/L)	6	0.113	1.810	0.366	0.536	0.634	
B Total Kjeldahl Nitrogen (mg/L)	3	< 0.089	0.302	0.044	0.130	0.149	
B Total Nitrogen (mg/L)	3	< 0.414	0.664	0.424	0.501	0.141	
J Dissolved Reactive Phosphorus (mg/L)	8	0.020	0.094	0.038 M	0.047	0.029	
B Total Phosphorus (mg/L)	3	0.013	0.027	0.026	0.022	0.008	
CBOD-5 (mg/L)	8	< 1.0	< 1.0	0.5	0.5	0.0	
Chlorides (mg/L)	8	1.1	7.4	1.9	2.7	2.1	
Atrazine (µg/L)	2	0.05	< 0.06	0.04	0.04	0.02	
Total Metals							
J Aluminum (mg/L)	4	< 0.060	0.084	0.030	0.044	0.027	
J Iron (mg/L)	4	0.127	0.180	0.172	0.162	0.024	
J Manganese (mg/L)	4	0.011	0.022	0.018	0.017	0.005	
Dissolved Metals							
J Aluminum (mg/L)	4	< 0.060	0.066	0.030	0.039	0.018	
Antimony (µg/L)	4	< 6.0	< 6.0	3.0	3.0	0.0	
J Arsenic (µg/L)	4	< 0.4	0.6 H	0.2	0.3	0.2	1
Cadmium (mg/L)	4	< 0.000	< 0.002	0.001	0.001	0.000	
Chromium (mg/L)	4	< 0.007	< 0.007	0.004	0.004	0.000	
Copper (mg/L)	4	< 0.200	< 0.200	0.100	0.100	0.000	
J Iron (mg/L)	4	< 0.020	0.084	0.072 M	0.059	0.034	
Lead (µg/L)	4	< 0.5	< 1.5	0.8	0.6	0.2	
J Manganese (mg/L)	4	< 0.009	0.017	0.012	0.011	0.006	
Nickel (mg/L)	4	< 0.008	< 0.008	0.004	0.004	0.000	
Selenium (µg/L)	4	< 0.4	< 0.4	0.2	0.2	0.0	
Silver (mg/L)	4	< 0.001	< 0.001	0.000	0.000	0.000	
Thallium (µg/L)	4	< 0.4	< 0.4	0.2	0.2	0.0	
Zinc (mg/L)	4	< 0.060	< 0.060	0.030	0.030	0.000	
Biological							
Chlorophyll a (ug/L)	8	< 1.00	3.47	0.50	1.11	1.16	
J Fecal Coliform (col/100 mL)	8	52	> 600	136	210	181	
J E. coli (col/100mL)	2	101	308	204	204	146	

B=samples excluded due to laboratory QC concerns; E=# samples that exceeded criteria; H=*F&W* human health criteria exceeded; J=estimate; M=value >90% of all verified ecoregional reference reach data collected in the ecoregion 71f; N=# samples.