

2009 Monitoring Summary



Basin Assessment Site

Higdon Creek at Dekalb County Road 812 (34.84408/-85.60467)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Higdon Creek watershed for biological and water quality monitoring as part of the 2009 Assessment of the Tennessee (TN) River Basin. The objectives of the Tennessee River Basin Assessments were to assess the biological integrity of each site and to estimate overall water quality within the Tennessee River basin. Habitat and macroinvertebrate assessments were conducted on Higdon Creek at HDND-1 on June 9, 2009.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Higdon Creek at HDND-1 is a *Fish & Wildlife (F&W)* stream located in Dekalb County (Figure 1). Landuse within the watershed is primarily forest (51%) with some pasture and cropland (33%). Population density is relatively low, and less than 10% of the area is developed. As of September 1, 2012, ADEM has issued one NPDES permit 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. Higdon Creek at HDND-1 is a low-gradient, glide-pool stream located in the Southern Table Plateaus ecoregion. The benthic substrate consists primarily of sand in an ecoregion where most streams are characterized by bedrock and boulder substrates (Griffith et al. 2001). Overall habitat quality and availability were rated as *poor* for supporting diverse aquatic macroinvertebrate communities due to limited stable instream habitat, loss of riparian buffer zones, and a relatively straight stream channel.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Tennessee R
Drainage Area (mi ²)		12
Ecoregion ^a		68d
% Landuse		
Open water		<1
Wetland	Woody	<1
	Emergent herbaceous	<1
Forest	Deciduous	33
	Evergreen	4
	Mixed	14
Shrub/scrub		4
Grassland/herbaceous		1
Pasture/hay		28
Cultivated crops		5
Development	Open space	6
	Low intensity	3
	Moderate intensity	<1
Barren		<1
Population/km ^{2b}		8
# NPDES Permits ^c	TOTAL	1
	Construction Stormwater	1

a. Southern Table Plateaus

b. 2000 US Census

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

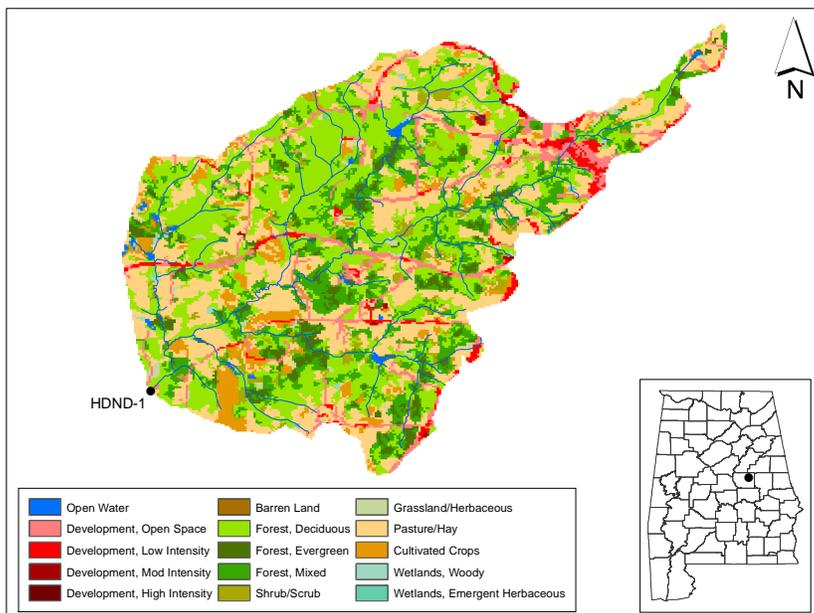


Figure 1. Sampling location and landuse within the Higdon Creek watershed at HDND-1.

Table 2. Physical characteristics of Higdon Creek at HDND-1, June 9, 2009.

Physical Characteristics		
Width (ft)		10.0
Canopy Cover		Shaded
Depth (ft)		
	Run	1.0
	Pool	1.5
% of Reach		
	Run	80
	Pool	20
% Substrate		
	Bedrock	5
	Boulder	2
	Clay	1
	Cobble	1
	Gravel	2
	Sand	69
	Silt	5
	Organic Matter	15

Table 3. Results of the habitat assessment conducted on Higdon Creek at HDND-1, June 9, 2009.

Habitat Assessment	% Maximum Score	Rating
Instream Habitat Quality	42	Marginal (41-58)
Sediment Deposition	56	Marginal (41-58)
Sinuosity	35	Poor <45
Bank and Vegetative Stability	23	Poor <35
Riparian Buffer	31	Poor <50
Habitat Assessment Score	89	
% Maximum Score	40	Poor <41

Table 4. Results of the macroinvertebrate bioassessment of Higdon Creek at HDND-1 conducted on June 9, 2009.

Macroinvertebrate Assessment		
	Results	Scores (0-100)
Taxa richness measures		
# EPT taxa	1	0
Taxonomic composition measures		
% Non-insect taxa	23	0
% Dominant taxon	26	59
% EPC taxa	10	0
Functional feeding group measures		
% Predators	9	31
Tolerance measures		
% Taxa as Tolerant	43	15
WMB-I Assessment Score	---	17
WMB-I Assessment Rating		Very poor (<20)

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. Metric results indicated that the biological community at HDND-1 was in *very poor* condition (Table 4).

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, semi-volatile organics, atrazine) during March through October of 2009 to help identify any stressors to the biological communities. Stream flows during the sampling period were >20 cfs during March, April, and October, but <2 cfs June through September. Dissolved oxygen concentrations were <5.0 mg/L during the low flow period. Dissolved copper and zinc exceeded the aquatic life use criteria in October and June, respectively. Median specific conductance, hardness, dissolved reactive phosphorus, chlorophyll *a*, and metals (total aluminum, total and dissolved iron, and total and dissolved manganese) were higher than expected, based on comparison with reference reach data collected in ecoregion 68d.

SUMMARY

Bioassessment results indicated the macroinvertebrate community in Higdon Creek at HDND-1 to be in *very poor* condition. Habitat assessment results were scored as *poor* due to sedimentation and limited instream habitat, which may have impacted the macroinvertebrate community. Additionally, intensive water quality sampling found elevated conductivity, hardness, metals and dissolved reactive phosphorus, which indicate a need for further monitoring to identify the causes and sources of the degraded biological conditions. Periods of low stream flow and oxygen availability may also negatively impact the biological community.

Table 5. Summary of water quality data collected March-October, 2009. Minimum (Min) and maximum (Max) values calculated using minimum detection limits (MDL). 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)	10	12.0	23.1	19.1	17.9	4.2	
Turbidity (NTU)	10	5.7	53.4	7.3	12.8	14.6	
^J Total Dissolved Solids (mg/L)	8	53.0	115.0	67.5	73.8	22.1	
^J Total Suspended Solids (mg/L)	8	< 1.0	55.0	5.5	11.0	18.2	
Specific Conductance (µmhos)	10	63.3	126.2	78.2 ^G	82.2	20.0	
Hardness (mg/L)	4	21.0	40.2	28.6 ^G	29.6	8.0	
Alkalinity (mg/L)	8	9.5	55.2	20.5	26.2	18.2	
Stream Flow (cfs)	9	0.1	41.9	2.3	12.6	16.4	
Chemical							
Dissolved Oxygen (mg/L)	10	2 ^C	9.7	6.2	6.2	2.9	5
pH (su)	10	6.2	7.4	6.7	6.7	0.3	
^{BJ} Ammonia Nitrogen (mg/L)	4	< 0.006	0.119	0.005	0.033	0.057	
^{BJ} Nitrate+Nitrite Nitrogen (mg/L)	7	0.020	1.807	0.435	0.734	0.750	
^{BJ} Total Kjeldahl Nitrogen (mg/L)	4	0.169	1.160	0.450	0.557	0.432	
^{BJ} Total Nitrogen (mg/L)	4	0.189	1.238	0.819	0.766	0.434	
^J Dissolved Reactive Phosphorus (mg/L)	8	0.005	0.096	0.012 ^M	0.039	0.043	
^{BJ} Total Phosphorus (mg/L)	4	0.018	0.038	0.028	0.028	0.009	
CBOD-5 (mg/L)	8	< 1.0	2.0	0.5	0.7	0.2	
Chlorides (mg/L)	8	1.9	3.9	3.2	3.0	0.8	
Atrazine (µg/L)	2	< 0.06	0.06	0.03	0.03	0.00	
Total Metals							
^J Aluminum (mg/L)	4	< 0.060	0.285	0.160 ^M	0.158	0.123	
Iron (mg/L)	4	0.668	1.580	0.980 ^M	1.052	0.444	
Manganese (mg/L)	4	0.112	2.260	0.194 ^M	0.690	1.049	
Dissolved Metals							
^J Aluminum (mg/L)	4	< 0.033	0.060	0.030	0.028	0.008	
Antimony (µg/L)	4	< 0.7	6.0	1.7	1.7	1.5	
^J Arsenic (µg/L)	4	< 0.4	1.6 ^H	0.5	0.7	0.6	1
Cadmium (µg/L)	4	< 2.000	3.000	1.250	1.250	0.289	
Chromium (mg/L)	4	< 0.007	0.013	0.005	0.005	0.002	
^J Copper (mg/L)	4	< 0.013	0.2 ^S	0.060 ^M	0.057	0.050	1
^J Iron (mg/L)	4	0.187	0.487	0.283 ^M	0.310	0.139	
Lead (µg/L)	4	< 0.6	1.5	0.6	0.6	0.2	
Manganese (mg/L)	4	0.080	2.030	0.177 ^M	0.616	0.944	
^J Mercury (µg/L)	3	< 0.080	0.080	0.040	0.040	0.000	
Nickel (mg/L)	4	< 0.004	0.019	0.004	0.005	0.003	
Selenium (µg/L)	4	< 0.4	1.5	0.2	0.3	0.3	
Silver (µg/L)	4	< 1.000	2.000	0.750	0.750	0.289	
Thallium (µg/L)	4	< 0.4	0.5	0.2	0.2	0.0	
Zinc (mg/L)	4	< 0.003	0.111 ^S	0.022	0.039	0.049	1
Biological							
Chlorophyll <i>a</i> (ug/L)	8	< 1.00	7.63	1.94 ^M	3.15	3.00	
^J Fecal Coliform (col/100 mL)	8	22	600	70	189	243	

C=F&W criterion violated; E=# samples that exceeded criteria; G=value higher than median concentration of all verified ecoregional reference reach data collected in the ecoregion 68d; H=F&W human health criteria exceeded; J=estimate; M=value >90% of all verified ecoregional reference reach data collected in the ecoregion 68d; N=# samples; S=F&W hardness-adjusted aquatic life use criteria exceeded.

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