

2009 Monitoring Summary



Hurricane Creek off Jackson County Road 9 (34.91799/-86.13300)

BACKGROUND

Hurricane Creek is a tributary to the Paint Rock River, which is one of the last remaining free flowing rivers found in the southeastern United States. It is home to 100 fish species and some mussels found only in this drainage. Because of these unique characteristics, the Fish & Wildlife Service (FWS), Geological Survey of Alabama (GSA), and Alabama Department of Conservation and Natural Resources (ADCNR) identified this drainage basin as a Strategic Habitat Unit.

Various state and federal agencies and non-profit groups like The Nature Conservancy (TNC) are dedicating substantial effort to preserving and protecting this watershed. The TNC has completed several bank re-stabilization projects throughout the Paint Rock River watershed. In 2011, the TNC plans to remove a culvert from Hurricane Creek at HURR-1 to help restore fish and mussel populations by reconnecting several stream miles. The culvert is impeding fish movement, causing mussel populations to become fragmented. In 2012, ADCNR plans to release *Threatened & Endangered* cultured mussels from the Alabama Aquatic Biodiversity Center into the Paint Rock River watershed.

The Alabama Department of Environmental Management (ADEM) selected the Hurricane Creek watershed for biological and water quality monitoring as part of the 2009 Assessment of the Tennessee (TN) River Basin. The objectives of the TN Basin Assessments were to assess the biological integrity of each monitoring site and to estimate overall water quality within the Tennessee River basin. The site was also monitored to document conditions prior to the implementation of best management practices.



Figure 1. Hurricane Creek at HURR-1, December 3, 2008. Photo taken facing downstream.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin	Tennessee River	
Drainage Area (mi²)	44	
Ecoregion^a	68c	
% Landuse		
Open water		<1
Wetland	Woody	<1
Forest	Deciduous	92
	Evergreen	<1
	Mixed	1
Shrub/scrub		1
Grassland/herbaceous		<1
Pasture/hay		3
Cultivated crops		<1
Development	Open space	1
	Low intensity	<1
Barren		<1
Population/km^{2b}	2	
# NPDES Permits^c	TOTAL	1
Coastal Certification		1

a. Plateau Escarpment

b. 2006 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. Hurricane Creek is a small *Fish & Wildlife (F&W)* stream located within the Paint Rock River watershed near the Alabama/Tennessee state line in the Tennessee River basin. Based on the 2006 National Land Cover Dataset, landuse within the watershed is primarily forest (93%). The watershed is extremely rural and largely undisturbed. 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. Hurricane Creek at HURR-1 is a high-gradient, mostly sand and gravel bottomed stream in the Tennessee River basin (Figure 1). Overall habitat quality was categorized as *optimal*, however most parameters fell into the *sub-optimal* category.

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 the macroinvertebrate community to be in *good* condition (Table 4).

Table 2. Physical characteristics of Hurricane Creek at HURR-1, June 10, 2009.

Physical Characteristics		
Width (ft)	45	
Canopy Cover	Estimate 50/50	
Depth (ft)	Riffle	0.7
	Run	2.5
	Pool	4.0
% of Reach	Riffle	5
	Run	80
	Pool	15
% Substrate	Boulder	2
	Cobble	10
	Gravel	30
	Sand	50
	Silt	1
	Organic Matter	7

Table 3. Results of the habitat assessment conducted on Hurricane Creek at HURR-1, June 10, 2009.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	68	Sub-optimal (59-70)
Sediment Deposition	75	Optimal (>70)
Sinuosity	65	Sub-optimal (65-84)
Bank and Vegetative Stability	71	Sub-optimal (60-74)
Riparian Buffer	70	Sub-optimal (70-89)
Habitat Assessment Score	171	
% Maximum Score	71	Optimal >70

Table 4. Results of the macroinvertebrate bioassessment conducted in Hurricane Creek at HURR-1, June 10, 2009.

Macroinvertebrate Assessment			
	Results	Scores	Rating
Taxonomic composition measures		(0-100)	
# Plecoptera taxa	2	40	Good (20-59)
# EPT taxa	24	100	Excellent (≥75)
Taxonomic composition measures			
% Non-insect taxa	11	45	Good (37-68)
% Dominant taxon	17	83	Excellent (≥76)
Tolerance measures			
Beck's community tolerance index	10	35	Good (32-65)
# Intolerant taxa	8	39	Good (37-67)
WMB-I Assessment Score	---	57	Good (48-73)

WATER CHEMISTRY

Results of water chemistry analyses 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 2009 to help identify any stressors to the biological communities. Arsenic levels exceeded the criterion to applicable Hurricane Creek's F&W use classification during the August 26, 2009 sampling event. Median specific conductance and hardness results were greater than the median of all ecoregional reference reach data collected in the Plateau Escarpment ecoregion. Concentrations of total dissolved solids, alkalinity, dissolved reactive phosphorous, and copper were above values expected based on the 90th percentile of data collected at reference reaches in the Plateau Escarpment ecoregion (68c).

SUMMARY

Bioassessment results indicated the macroinvertebrate community to be in *good* condition, and overall habitat quality to be *optimal*. The arsenic exceeded the human health criterion on August 26, 2009. Median concentrations of total dissolved solids, specific conductance, hardness, alkalinity, and dissolved copper were higher than expected for ecoregion 68c.

In October 2010, USFWS, and the Geological Survey of Alabama will conduct road and bridge crossing surveys to document impediments to fish movement. In 2011, TNC plans to remove the low head crossing at HURR-1 and replace with a low span bridge to allow upstream fish movement.

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)	10	12.7	26.1	17.5	18.4	4.6	
Turbidity (NTU)	10	2.5	6.0	4.2	4.3	1.0	
^J Total Dissolved Solids (mg/L)	8	104.0	172.0	169.5 ^M	154.6	24.9	
^J Total Suspended Solids (mg/L)	8	< 0.3	16.0	2.0	3.6	5.1	
Specific Conductance (µmhos)	10	222.0	327.0	267.9 ^G	272.4	38.2	
Hardness (mg/L)	4	120.0	158.0	143.0 ^G	141.0	17.3	
Alkalinity (mg/L)	8	95.2	174.0	139.0 ^M	137.0	29.0	
Stream Flow (cfs)	7	16.4	52.4	31.1	30.4	16.4	
Chemical							
Dissolved Oxygen (mg/L)	10	6.0	10.4	8.7	8.3	1.6	
pH (su)	10	7.5	8.0	7.8	7.8	0.2	
^{JB} Ammonia Nitrogen (mg/L)	1			<	0.014		
^{JB} Nitrate+Nitrite Nitrogen (mg/L)	6	< 0.003	0.286	0.041	0.076	0.108	
^{JB} Total Kjeldahl Nitrogen (mg/L)	1				0.400		
^{JB} Total Nitrogen (mg/L)	1				0.462		
^{JB} Dissolved Reactive Phosphorus (mg/L)	7	< 0.008	0.090	0.011	0.024	0.030	
^{JB} Total Phosphorus (mg/L)	1				0.015		
CBOD-5 (mg/L)	8	< 1.0	< 2.0	0.5	0.6	0.2	
Chlorides (mg/L)	8	0.7	11.4	5.7	5.8	4.5	
Atrazine (µg/L)	2	< 0.06	< 0.06	0.03	0.03	0.00	
Total Metals							
^J Aluminum (mg/L)	4	< 0.060	0.061	0.046	0.046	0.018	
^J Iron (mg/L)	4	0.106	0.225	0.157	0.161	0.052	
^J Manganese (mg/L)	4	0.020	0.048	0.030	0.032	0.012	
Dissolved Metals							
^J Aluminum (mg/L)	4	< 0.060	0.068	0.030	0.040	0.019	
Antimony (µg/L)	4	< 0.5	< 6.0	1.8	1.7	1.5	
^J Arsenic (µg/L)	4	< 0.4	0.9 ^H	0.2	0.4	0.4	1
Cadmium (mg/L)	4	< 0.0004	< 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 ^M	0.100	0.000	
^J Iron (mg/L)	4	< 0.020	0.072	0.010	0.026	0.031	
Lead (µg/L)	4	< 1.5	< 1.5	0.8	0.8	0.0	
^J Manganese (mg/L)	4	0.019	0.039	0.023	0.026	0.009	
^{JB} Mercury (µg/L)	2	< 0.080	0.153 ^{AH}	0.096	0.096	0.080	1
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 (µg/L)	8	< 0.10	9.26	0.50	2.22	3.27	
^J Fecal Coliform (col/100 mL)	8	15	188	101	95	59	
^J E. coli (col/100mL)	3	86	308	172	189	112	

J=estimate; B=one or more samples excluded from calculations because they did not meet laboratory QC requirements; N=# samples; A=F&W aquatic life use criterion exceeded; H=F&W human health criterion exceeded; G=value greater than median concentration of all verified reference data collected in ecoregion 68c; M=value > 90% of all verified ecoregional reference reach data collected in the ecoregion 68c; E=# of samples that exceed criterion.

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