ADEM
Alabama Department of Environmental Management

Rivers and Streams Monitoring Program

2016 Monitoring Summary

™

Excellent

Ecological Reference Reach

Hurricane Creek upstream of Randolph County Road 26 (33.17546/-85.59829)

BACKGROUND

Hurricane Creek is among the least-disturbed watersheds within the Southern Inner Piedmont ecoregion, based on landuse, road density, and population density. Since 1992, it has been monitored by the Alabama Department of Environmental Management (ADEM) as a "high quality" reference watershed for comparison with other streams within the ecoregion. Data from reference watersheds are used to characterize natural or background conditions expected in different ecoregions throughout the state. Hurricane Creek was sampled in 2016 to provide high-quality reference reach data for Southern Inner Piedmont streams. Habitat and macroinvertebrate community surveys were conducted to assess the health of biological communities.

Figure 1. Hurricane Creek at HCR-1, May 18, 2016.

Table 1. Summary of general watershed characteristics: HCR-1 (2016)

Watershed Characteristics	
Basin	Tallapoosa
Drainage Area (mi²)	13.7
Ecoregion°	45A
Assessment Unit	AL03150109-0106-400
Use Class	F&W
AU Category	1
12-digit Hydrologic Unit Code (HUC)	031501090106
Landuse Categories (2011 National Land Cover Dataset)	
Wetland, Total (%)	0.4
Wetlands, Woody (%)	0.4
Forested, Total (%)	75.6
Forested, Deciduous (%)	43.9
Forested, Evergreen (%)	31.7
Forested, Mixed (%)	0.1
Shrub/Scrub (%)	11.1
Grassland/Herbaceous (%)	9.7
Pasture/Hay (%)	0.8
Developed, Total (%)	1.9
Developed, Open Space (%)	1.8
Developed, Low Intensity (%)	0.1
Barren Land (Rock, Sand, Clay) (%)	0.3
Population/km² (2010 US Census)	2
Roads	
Road Density	1.4
# Road Crossings per Stream km	0.3
Watershed Disturbance Score*	34
Watershed Disturbance Category*	1

° Southern Inner Piedmont

* Measure of watershed disturbance based on landuse, population, and road density summarized in this table.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Hurricane Creek is a small *Fish & Wildlife (F&W)* stream located near the city of Wadley in the Tallapoosa River basin. According to the 2011 National Land Cover Dataset, the watershed is over 75% forested, with no permitted outfalls. The watershed is of excellent quality. It is very sparsely populated and has a low road density. The ADEM's measure of watershed disturbance ranked the Hurricane Creek watershed in the top 95th percentile of the 1,450 wadeable, flowing watersheds sampled by ADEM throughout the state.

REACH CHARACTERISTICS

General observations (Figure 1, Table 2) and a habitat survey (Table 3) were completed during the macroinvertebrate assessment. In comparison with other reference reaches in the same ecoregion, they give an indication of the physical condition of the site and the quality and availability of habitat. Like other streams in ecoregion 45A, Hurricane Creek at HCR-1 is a moderate gradient stream characterized predominantly by a sandy substrate with some gravel. Overall habitat quality and availability has been rated as *sub-optimal* for supporting the macroinvertebrate communities. However, bank stability and sedimentation were noted as concerns within the stream.

Table 2. Physical characteristics of Hurricane Creek at HCR-1, May 18, 2016.

Physical Characteristics		
Width (ft)		30
Canopy Cover		Mostly Shaded
Depth (ft)		
	Riffle	0.5
	Run	1.0
	Pool	1.5
% of Reach		
	Riffle	5
	Run	85
	Pool	10
% Substrate		
	Boulder	1
	Cobble	4
	Gravel	25
	Sand	50
	Silt	13
	Organic Matter	7

Table 3. Results of the habitat assessment survey conducted on Hurricane Creek at HCR-1, May 18, 2016.

Habitat Survey	% Max Score	Rating
Instream Habitat Quality	68	Sub-optimal (55-75)
Sediment Deposition	54	Marginal (30-54)
Riffle Frequency	63	Sub-optimal (55-75)
Bank Vegetative Stability	56	Marginal (30-57)
Riparian Zone Measurements	70	Sub-optimal (60-75)
Habitat Assessment Score	**125**	
% Maximum Score	**63**	**Sub-optimal (57-75)**

BIOASSESSMENT RESULTS

The benthic macroinvertebrate community was sampled using ADEM's Intensive Multi-habitat Bioassessment methodology (WMB-I). Measures of taxonomic richness, community composition and pollution tolerance were used to assess the overall health of the macroinvertebrate community in comparison to conditions expected in central Alabama streams and rivers. Each site is placed in one of six levels ranging from 1, or *natural*, to 6, or *highly altered*. The WMB-I score of the macroinvertebrate community of Hurricane Creek at HCR-1 was 2, identifying the reach as a near natural site in *excellent* condition. A total of 84 taxa, including 45 pollution-sensitive taxa, were collected at the site. Fifteen taxa are only found in the most pristine streams throughout Alabama and the southeast (Table 4).

Table 4. Results of the macroinvertebrate assessment conducted in Hurricane Creek at HCR-1, May 18, 2016.

Macroinvertebrate Assessment	Results
Taxonomic richness and diversity metrics	
Total # taxa	84
# rare and highly sensitive taxa	15
# sensitive taxa	45
# sensitive EPT taxa	19
Percent taxon metrics	
% sensitive EPT taxa	23
% sensitive taxa	54
% rare and highly sensitive taxa	18
% tolerant individuals	6
% tolerant taxa	6
Percent individual metrics	
% rare and highly sensitive individuals	17
% sensitive individuals	25
% sensitive EPT individuals	6
WMB-I Survey Score	**2**
WMB-I Survey Rating	**Excellent (1-2)**

WATER CHEMISTRY

Results of water chemistry analyses are summarized in Table 5. In situ measurements and water samples were collected monthly and semi-monthly (metals), from March through October 2016 to help characterize the reach. Water temperatures ranged from 14.8 to 24.6 degrees Celsius. Dissolved oxygen concentrations ranged from 7.4 to 10.0 mg/L, reflecting the cool temperatures. Turbidity was also low, ranging from 1.7 to 5.3 NTU.

The single sample maximum E. coli criterion for F&W waters sampled between May and October is 298 colonies/100mL. This criterion was exceeded in the August and September, with counts of 344.8 and 613.1, respectively. Stream flow was low. Stream pH was <6.5 during all but one sampling visit in May, which is less than expected for streams in ecoregion 45A..

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Table 5. Summary of water quality data collected March-October, 2016. 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		14.8		24.6	18.0	19.0	3.8	
Turbidity (NTU)	9		1.7		5.3	2.3	2.7	1.2	
Total Dissolved Solids (mg/L)	8	<	1.0		38.0	20.5	19.9	10.3	
Total Suspended Solids (mg/L)	8	<	1.0		7.0	2.0	2.4	2.1	
Specific Conductance (µmhos/cm)	9		13.5		18.9	16.6	16.5	2.1	
Hardness (mg/L)	3		4.2		5.4	5.2	4.9	0.6	
Alkalinity (mg/L)	8		3.8		6.9	5.5	5.3	1.0	
Monthly Stream Flow (cfs)	8		0.4		38.6	10.0	13.5	13.6	
Measured Stream Flow (cfs)	8		0.4		38.6	10.0	13.5	13.6	
Chemical									
Dissolved Oxygen (mg/L)	9		7.4		10.0	8.5	8.7	0.9	
pH (SU)	9		6.1		6.9	6.2 [M]	6.2	0.2	
[J] Ammonia Nitrogen (mg/L)	8	<	0.007	<	0.030	0.004	0.006	0.005	
[J] Nitrate+Nitrite Nitrogen (mg/L)	8		0.004		0.112	0.036	0.041	0.036	
Total Kjeldahl Nitrogen (mg/L)	8	<	0.038		0.159	0.025	0.057	0.062	
[J] Dis Reactive Phosphorus (mg/L)	8	<	0.002		0.003	0.002	0.002	0.001	
[J] Total Phosphorus (mg/L)	8		0.005		0.010	0.008	0.007	0.002	
CBOD-5 (mg/L)	8	<	2.0	<	2.0	1.0	1.0	0.0	
COD (mg/L)	8	<	2.5		3.2	1.5	1.8	0.7	
[J] TOC (mg/L)	8		0.8		1.6	1.0	1.1	0.2	
Chlorides (mg/L)	8		1.2		1.4	1.3	1.3	0.0	
Sulfate (mg/L)	8		0.77		1.03	0.83	0.86	0.10	
Total Metals									
Aluminum (mg/L)	3	<	0.106	<	0.106	0.053	0.053	0.000	
[J] Iron (mg/L)	3		0.145		0.299	0.263	0.236	0.080	
[J] Manganese (mg/L)	3	<	0.004		0.008	0.002	0.004	0.003	
Dissolved Metals									
Aluminum (mg/L)	3	<	0.106	<	0.106	0.053	0.053	0.000	
Antimony (µg/L)	3	<	0.383	<	0.383	0.192	0.192	0.000	
Arsenic (µg/L)	3	<	0.415	<	0.415	0.208	0.208	0.000	
Cadmium (µg/L)	3	<	0.385	<	0.385	0.192	0.192	0.000	
Chromium (µg/L)	3	<	0.445	<	0.445	0.222	0.222	0.000	
Copper (µg/L)	3	<	0.454	<	0.454	0.227	0.227	0.000	
[J] Iron (mg/L)	3	<	0.063		0.166	0.141	0.113	0.072	
Lead (µg/L)	3	<	0.362	<	0.362	0.181	0.181	0.000	
[J] Manganese (mg/L)	3	<	0.004		0.007	0.002	0.004	0.003	
Nickel (µg/L)	3	<	0.705	<	0.705	0.352	0.352	0.000	
Selenium (µg/L)	3	<	0.505	<	0.505	0.252	0.252	0.000	
Silver (µg/L)	3	<	0.478	<	0.478	0.239	0.239	0.000	
Thallium (µg/L)	3	<	0.348	<	0.348	0.174	0.174	0.000	
[J] Zinc (µg/L)	3	<	0.564		1.257	0.718	0.752	0.488	
Biological									
Chlorophyll a (mg/m³)	8	<	0.10		1.07	0.53	0.49	0.42	
[J] E. coli (MPN/DL)	8		37.3		613.1 [H]	83.6	190.9	207.4	2

E= # of samples that exceeded criteria; H= *F&W* human health criterion exceeded; J=estimate; M=value < 90% of all verified ecoregional reference reach data collected in the ecoregion 45A ; N=# samples

SUMMARY

The ADEM monitors Hurricane Creek at HCR-1 as a "high-quality" reference reach for comparison with other Southern Inner Piedmont streams. Hurricane Creek at HCR-1 is typical of streams in the region, characterized by low to moderate gradient streams with a mostly gravel and sandy substrate.

This watershed, which contains no permitted outfalls and is 75% forested, is among the best in Alabama. The overall habitat quality and availability was rated as *sub-optimal* for supporting the macroinvertebrate communities, which were rated as *excellent* due to high diversity and taxa richness within the reach. Monitoring should continue at the site to ensure that conditions remain stable.