

2019 Monitoring Summary



Ecological Reference Reach

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

BACKGROUND

Hurricane Creek is among the least-disturbed watersheds within the Plateau Escarpment 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. Habitat, and macroinvertebrate community surveys were conducted to assess the health of the biological communities. Data from reference watersheds are used to characterize natural or background conditions expected in different ecoregions throughout the state. Hurricane Creek was sampled in 2019 to provide high-quality reference reach data for Plateau Escarpment streams.



Figure 1. Hurricane Creek at HURR-1, June 6, 2019.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Hurricane Creek is an *Outstanding Alabama Waterway/ Fish & Wildlife (OAW/F&W)* stream located in Jackson county near Double Hytop, AL in the Tennessee River basin. According to the 2011 National Land Cover Dataset, the watershed is mostly forested, with approximately 94% forest. This watershed is of exceptional quality, is sparsely populated and has undergone very little development. The watershed also has a very low road density.

REACH CHARACTERISTICS

General observations (Figure 1, Table 2) and a habitat survey (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. Like other streams in ecoregion 68c, Hurricane Creek at HURR-1 is a high gradient stream characterized predominantly by a boulder, cobble, and gravel substrate. Overall habitat quality and availability has been rated as *sub-optimal* for supporting the macroinvertebrate communities due to infrequency of riffles.

Table 1. Summary of general watershed characteristics: HURR-1

Watershed Characteristics	
Basin	Tennessee
Drainage Area (mi ²)	44.4
Ecoregion ^o	68c
Assessment Unit	AL06030002-0101-100
Use Class	OAW/F&W
AU Category	1
12-digit Hydrologic Unit Code (HUC)	060300020101
Conservation Status	
Strategic Habitat Unit †	9 Paint Rock River
Landuse Categories (2011 National Land Cover Dataset)	
Wetland, Total (%)	0.3
Wetlands, Woody (%)	0.3
Forested, Total (%)	93.5
Forested, Deciduous (%)	92.0
Forested, Evergreen (%)	0.5
Forested, Mixed (%)	1.0
Shrub/Scrub (%)	1.3
Grassland/Herbaceous (%)	0.6
Pasture/Hay (%)	3.0
Crops, Cultivated (%)	0.1
Developed, Total (%)	1.2
Developed, Open Space (%)	0.9
Developed, Low Intensity (%)	0.3
Population/km (2010 US Census)	2
Roads	
Road Density	0.7
# Road Crossings per Stream km	0.3
Watershed Disturbance Score*	30
Watershed Disturbance Category*	1

^o Plateau Escarpment

† 12-digit HUC located in a Strategic Habitat Unit.

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

Table 2. Physical characteristics of Hurricane Creek at HURR-1, May 29, 2019.

Physical Characteristics	
Width (ft)	40
Canopy Cover	Estimate 50/50
Depth (ft)	
Riffle	0.5
Run	1.5
Pool	5.0
% of Reach	
Riffle	2
Run	48
Pool	50
% Substrate	
Boulder	25
Cobble	25
Gravel	25
Sand	13
Silt	5
Organic Matter	7

Table 3. Results of the habitat assessment survey conducted on Hurricane Creek at HURR-1, May 29, 2019.

Habitat Survey	% Max Score	Rating
Instream Habitat Quality	80	Optimal (80-100)
Sediment Deposition	65	Sub-optimal (55-74.999)
Riffle Frequency	45	Marginal (30-49.999)
Bank Vegetative Stability	64	Sub-optimal (55-74.999)
Riparian Zone Measurements	66	Sub-optimal (55-74.999)
Habitat Assessment Score	135	
% Maximum Score	68	Sub-optimal (55-69.999)

Table 4. Results of the macroinvertebrate survey conducted on Hurricane Creek at HURR-1, May 29, 2019.

Macroinvertebrate Assessment	Results	Scores
Taxonomic richness and diversity metrics		
# EPT Taxa	21	74
% Non-Insect Taxa	11	60
Taxonomic composition metrics		
% EPC Individuals	23	42
% Dominant Taxon	15	90
Functional composition metrics		
% Predators	10	39
Tolerance metrics		
% Tolerant Taxa	31	53
WMB-I Survey Score		59.7
WMB-I Survey Rating		Good

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 streams and rivers flowing through the Southwestern Appalachians Ecoregion (68). Each site is scored on a scale of 0-100 and calibrated to ecoregional reference reach conditions to rate as "excellent", "good", "fair", "poor", or "very poor".

Macroinvertebrate survey results indicate the community to be in *good* condition. Eighty-four total taxa were collected, including seven rare, sensitive taxa, and 18 sensitive taxa (30% of total taxa) (Table 4).

WATER CHEMISTRY

Results of water chemistry analyses are summarized in Table 5. In situ measurements and water samples were collected during April, June, August and October 2019 to help characterize the reach. Individual values of water ammonia nitrogen and selenium were greater than the 90th percentile of all verified ecoregional reference reach data collected in the ecoregion 68c. E. coli exceeded the *OAW/F&W* single sample human health criterion during one sampling event.

SUMMARY

The ADEM monitors Hurricane Creek as a "high-quality" reference reach for comparison with other streams in the Plateau Escarpment ecoregion. Hurricane Creek at HURR-1 is typical of streams in the region, characterized by high gradient streams with a boulder, cobble and gravel substrate.

Water quality conditions are very high. Individual values of water ammonia nitrogen and selenium were greater than the 90th percentile of all verified ecoregional reference reach data collected in the ecoregion 68c. E. coli exceeded the *OAW/F&W* single sample human health criterion during one sampling event. The overall habitat quality and availability has been rated as *sub-optimal* for supporting the macroinvertebrate community due to low frequency of riffles. The macroinvertebrate community is rated to be in *good* condition.

Table 5. Summary of water quality data collected during April, June, August and October 2019. 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.

HURR-1 AL06030002-0101-100	N	Min	Max	Med	Avg	SD	E	10thP	90thP
Physical									
Temperature (°C)	6	12.2	24.5	19.0	18.9	4.6		12.2	24.5
Turbidity (NTU)	6	1.5	5.6	2.8	3.2	1.4		1.5	5.6
Total Dissolved Solids (mg/L)	3	157.0	182.0	172.0	170.3	12.6		157.0	182.0
Total Suspended Solids (mg/L)	3	<1.0	3.0	2.0	1.8	1.2		0.5	3.0
Specific Conductance (µmhos/cm)	6	212.7	295.0	274.6	262.3	33.0		212.7	295.0
Hardness (mg/L)	4	116.0	153.0	144.0	139.2	17.3		116.0	153.0
Alkalinity (mg/L)	4	<2.5	137.0	122.5	95.8	64.1		1.2	137.0
Measured Stream Flow (cfs)	6	1.5	51.8	14.8	20.3	19.4		1.5	51.8
Chemical									
Dissolved Oxygen (mg/L)	6	5.9	11.0	7.9	8.1	2.0		5.9	11.0
pH (SU)	6	7.6	7.9	7.8	7.8	0.1		7.6	7.9
Ammonia Nitrogen (mg/L)	4	0.012	0.050 ^D	0.028	0.030	0.019		0.012	0.050
Nitrate+Nitrite Nitrogen (mg/L)	4	0.057	0.163	0.092	0.101	0.044		0.057	0.163
Total Kjeldahl Nitrogen (mg/L)	4	0.121	3.310	0.298	1.007	1.540		0.121	3.310
Total Nitrogen (mg/L)	4	0.178	3.407	0.424	1.108	1.538		0.178	3.407
Dis Reactive Phosphorus (mg/L)	4	<0.006	0.009	0.006	0.006	0.003		0.003	0.009
Total Phosphorus (mg/L)	4	0.008	0.016	0.010	0.011	0.003		0.008	0.016
TOC (mg/L)	4	1.7	2.7	1.9	2.0	0.5		1.7	2.7
CBOD-5 (mg/L)	4	<2.0	<2.0	1.0	1.0	0.0		1.0	1.0
COD (mg/L)	4	2.0	8.0	5.1	5.0	2.6		2.0	8.0
Chlorides (mg/L)	4	0.7	1.5	1.1	1.1	0.4		0.7	1.5
Sulfate (mg/L)	4	9.48	10.90	9.80	9.99	0.64		9.48	10.90
Total Metals									
Aluminum (T) (mg/L)	4	<0.023	0.272	0.096	0.119	0.110		0.012	0.272
Iron (T) (mg/L)	4	0.061	0.189	0.110	0.118	0.059		0.061	0.189
Manganese (T) (mg/L)	4	<0.004	<0.004	0.002	0.002	0.000		0.002	0.002
Dissolved Metals									
Aluminum (mg/L)	4	<0.023	0.065	0.026	0.032	0.026		0.012	0.065
Antimony (µg/L)	4	<1.480	<1.480	0.740	0.740	0.000		0.740	0.740
Arsenic (µg/L)	4	<0.689	<0.689	0.344	0.344	0.000		0.344	0.344
Cadmium (µg/L)	4	<0.726	<0.726	0.363	0.363	0.000		0.363	0.363
Chromium (µg/L)	4	<0.793	<0.793	0.396	0.396	0.000		0.396	0.396
Copper (µg/L)	4	<1.190	<1.190	0.595	0.595	0.000		0.595	0.595
Iron (mg/L)	4	<0.063	<0.063	0.032	0.032	0.000		0.032	0.032
Lead (µg/L)	4	<0.697	<0.697	0.348	0.348	0.000		0.348	0.348
Manganese (mg/L)	4	<0.004	<0.004	0.002	0.002	0.000		0.002	0.002
Nickel (µg/L)	4	<1.960	<1.960	0.980	0.980	0.000		0.980	0.980
Selenium (µg/L)	4	<1.900	1.950 ^D	0.950	1.200	0.500		0.950	1.950
Silver (µg/L)	4	<1.350	<1.350	0.675	0.675	0.000		0.675	0.675
Thallium (µg/L)	4	<0.641	<0.641	0.320	0.320	0.000		0.320	0.320
Zinc (µg/L)	4	<2.340	<2.340	1.170	1.170	0.000		1.170	1.170
Biological									
Chlorophyll a (mg/m ³)	4	<1.00	4.00	1.07	1.66	1.58		0.50	4.00
E. coli (MPN/DL)	4	140.1	260.3 ^H	189.8	195.0	50.3	1	140.1	260.3

D=an individual value >90% of all verified ecoregional reference reach data collected in the ecoregion 68c; E=# of samples that exceed criterion.; H=*OAW/F&W* human health criterion exceeded; J=estimate; N=# samples.

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