Alabama Department of Environmental Management

Ecological Reference Reach

Rivers and Streams Monitoring Program

2019 Monitoring Summary

Good-Excellent

Brushy Creek at Winston County Road 3159. (34.25300/87.24700)

BACKGROUND

Brushy Creek is among the least-disturbed watersheds within the Dissected Plateau ecoregion, based on landuse, road density, and population density. Since 2015, 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. Brushy Creek was sampled in 2019 to provide high-quality reference reach data for Dissected Plateau streams.

Figure 1. Brushy Creek at BRSW-2, June 11, 2019.

Table 1. Summary of general watershed characteristics: BRSW-2

Watershed Characteristics	
Basin	Black Warrior
Drainage Area (mi²)	59.8
Ecoregion°	68e
Assessment Unit	AL03160110-0203-103
Use Class	F&W
AU Category	1
12-digit Hydrologic Unit Code (HUC)	031601100201
Conservation Status	
Strategic Habitat Unit †	22 Upper Sipsey Fork
Landuse Categories (2011 National Land Cover Dataset)	
Open Water (%)	0.1
Wetland, Total (%)	0.7
Wetlands, Woody (%)	0.7
Wetlands, Emergent Herbaceous (%)	<1
Forested, Total (%)	92.2
Forested, Deciduous (%)	32.9
Forested, Evergreen (%)	34.9
Forested, Mixed (%)	24.4
Shrub/Scrub (%)	2.2
Grassland/Herbaceous (%)	0.7
Pasture/Hay (%)	2.0
Crops, Cultivated (%)	0.1
Developed, Total (%)	2.0
Developed, Open Space (%)	1.9
Developed, Low Intensity (%)	<1
Developed, Medium Intensity (%)	<1
Developed, High Intensity (%)	<1
Barren Land (Rock, Sand, Clay) (%)	<1
Population/km² (2010 US Census)	1
Roads	
Road Density	0.7
# Road Crossings per Stream km	0.1
Watershed Disturbance Score*	**31**
Watershed Disturbance Category*	**1**

° Dissected Plateau

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

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

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Brushy Creek is a *Fish & Wildlife (F&W)* stream located inside the Bankhead National Forest near Addison, AL in the Black Warrior River basin. According to the 2011 National Land Cover Dataset, the watershed is mostly forested, with approximately 92% forest. There are no permitted outfalls. This watershed is of exceptional quality and is very sparsely populated and has undergone very little development. The watershed 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 68e, Brushy Creek at BRSW-2 is a high gradient stream characterized predominantly by a boulder and cobble substrate. Overall habitat quality and availability has been rated as *Sub-optimal* for supporting the macroinvertebrate communities due to a large riparian buffer, low sediment deposition, and stable banks.

Table 2. Physical characteristics of Brushy Creek at BRSW-2, June 19, 2019.

Physical Characteristics	
Width (ft)	30
Canopy Cover	Mostly Open
Depth (ft)	
Riffle	0.5
Run	1.0
Pool	2.0
% of Reach	
Riffle	10
Run	30
Pool	60
% Substrate	
Boulder	25
Cobble	24
Gravel	46
Sand	40
Silt	1
Organic Matter	4

Table 3. Results of the habitat assessment survey conducted on Brushy Creek at BRSW-2, June 19, 2019.

Habitat Survey	% Max Score	Rating
Instream Habitat Quality	73	Sub-optimal (55-74.999)
Sediment Deposition	55	Sub-optimal (55-74.999)
Riffle Frequency	53	Marginal/Sub-optimal (50-54.999)
Bank Vegetative Stability	71	Sub-optimal (55-74.999)
Riparian Zone Measurements	91	Optimal (80-100)
Habitat Assessment Score	**141**	
% Maximum Score	**71**	**Sub-optimal (55-74.999)**

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 macroinvertebrate community on Brushy Creek at BRSW-2 was rated as *good-excellent*, with 88 total taxa, 9 rare, highly sensitive taxa (Attribute 2), 24 ubiquitous, sensitive taxa (Attribute 3), and 14 Attribute 2 and 3 EPT. The community was comprised of 37% attribute 2 and 3 taxa (Table 4).

Table 4. Results of the macroinvertebrate survey conducted on Brushy Creek at BRSW-2, June 19, 2019.

Macroinvertebrate Assessment	Results
Taxonomic richness and diversity metrics	
Total # taxa	88
# rare and highly sensitive taxa	9
# sensitive taxa	33
# sensitive EPT taxa	14
Percent taxon metrics	
% sensitive EPT taxa	16
% sensitive taxa	38
% rare and highly sensitive taxa	10
% tolerant taxa	10
Percent individual metrics	
% rare and highly sensitive individuals	7
% sensitive individuals	14
% sensitive EPT individuals	6
% tolerant individuals	9
WMB-I Survey Score	**3+**
WMB-I Survey Rating	**Good-excellent (2.3-2.75)**

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. E.coli was documented as exceeding the *F&W* single sample criterion during the October sampling. All other parameters are within the expected values for ecoregion 68e.

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.

	BRSW-2 AL03160110-0203-103	N	Min	Max	Med	Avg	SD	E	10thP	90thP
	Physical									
	Temperature (°C)	5	10.8	24.4	21.3	19.4	5.9		10.8	24.4
	Turbidity (NTU)	5	2.6	6.5	3.8	4.2	1.6		2.6	6.5
	Total Dissolved Solids (mg/L)	4	22.0	34.0	26.5	27.2	5.0		22.0	34.0
	Total Suspended Solids (mg/L)	4	1.0	3.0	1.5	1.6	1.1		0.5	3.0
	Specific Conductance (µmhos/cm)	5	24.9	39.1	35.6	34.1	5.4		24.9	39.1
	Hardness (mg/L)	4	8.5	12.7	11.7	11.2	1.9		8.5	12.7
	Alkalinity (mg/L)	4	6.5	12.1	11.3	10.3	2.6		6.5	12.1
	Measured Stream Flow (cfs)	5	7.2	36.5	11.8	16.6	11.8		7.2	36.5
	Chemical									
	Dissolved Oxygen (mg/L)	5	7.4	11.3	8.5	8.8	1.4		7.4	11.3
	pH (SU)	5	6.7	7.6	7.0	7.0	0.3		6.7	7.6
	Ammonia Nitrogen (mg/L)	4	<0.004	<0.016	0.008	0.006	0.003		0.002	0.008
	Nitrate+Nitrite Nitrogen (mg/L)	4	0.059	0.137	0.088	0.093	0.034		0.059	0.137
J	Total Kjeldahl Nitrogen (mg/L)	4	<0.075	0.224	0.100	0.115	0.078		0.038	0.224
J	Total Nitrogen (mg/L)	4	<0.096	0.326	0.206	0.209	0.097		0.096	0.326
	Dis Reactive Phosphorus (mg/L)	4	<0.005	<0.005	0.002	0.002	0.000		0.002	0.002
J	Total Phosphorus (mg/L)	4	0.006	0.017	0.010	0.011	0.004		0.006	0.017
	TOC (mg/L)	4	1.4	3.5	2.9	2.6	0.9		1.4	3.5
	CBOD-5 (mg/L)	4	<2.0	<2.0	1.0	1.0	0.0		1.0	1.0
	COD (mg/L)	4	4.6	10.7	8.8	8.2	2.6		4.6	10.7
	Chlorides (mg/L)	4	1.2	2.1	1.3	1.5	0.4		1.2	2.1
	Sulfate (mg/L)	4	1.67	2.77	2.42	2.32	0.52		1.67	2.77
	Total Metals									
J	Aluminum (T) (mg/L)	4	0.090	0.185	0.145	0.141	0.050		0.090	0.185
J	Iron (T) (mg/L)	4	0.194	0.613	0.450	0.426	0.210		0.194	0.613
J	Manganese (T) (mg/L)	4	<0.004	<0.004	0.002	0.002	0.000		0.002	0.002
	Dissolved Metals									
J	Aluminum (mg/L)	4	0.041	0.082	0.051	0.056	0.018		0.041	0.082
	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
J	Iron (mg/L)	4	0.084	0.359	0.270	0.246	0.129		0.084	0.359
	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	<1.900	0.950	0.950	0.000		0.950	0.950
	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/m³)	4	<1.001	2.14	1.60	1.46	0.82		0.50	2.14
J	E. coli (MPN/DL)	4	27.5	2419.6[H]	145.2	684.4	1159.7	1	27.5	2419.6

E=# of samples that exceed criterion.; H=Human Heath criteria; J=estimate; N=# samples

SUMMARY

The ADEM monitors Brushy Creek as a "high-quality" reference reach for comparison with other streams in the Dissected Plateau ecoregion. Brushy Creek at BRSW-2 is typical of streams in the region, characterized by high gradient streams with a boulder and cobble substrate.

Water quality conditions are very high. E.coli was documented as exceeding the *F&W* single sample criterion during the October sampling.The overall habitat quality and availability has been rated as *Sub-optimal* for supporting the macroinvertebrate communities, which is rated as *Good-Excellent* due to high diversity and taxa richness within the reach.

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