

2019 Monitoring Summary



Bear Head Creek at Conecuh National Forest Rd (FR311D) (31.112023, -86.712929).

BACKGROUND

Bear Head Creek is among the least-disturbed watersheds in the Blackwater River basin based on landuse, road density, and population density. Since 2014, 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. Bear Head Creek at BEHE-1 was sampled in 2019 as a candidate reference reach for riverine wetlands in Ecoregion 65F. A primary goal of this project is to calibrate WQ, habitat and biological conditions to baseline, natural conditions expected in this waterbody type. In addition to habitat and macroinvertebrate surveys and monthly water quality sampling, a floristic survey, a rapid wetland assessment, and an amphibian survey were also conducted.



Figure 1. Bear Head Creek at BEHE-1, April 24, 2019.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Bear Head Creek (Figure 1) is a *Fish & Wildlife (F&W)* tributary of the Blackwater River in the Southern Pine Plains and Hills ecoregion. This ecoregion is comprised of southward-sloping, dissected irregular plains, some open low hills, mostly broad gently sloping ridgetops with steeper side slopes near drainages; low to moderate gradient sand and clay bottomed streams. Based on the 2011 National Land Cover Dataset, seventy percent of landuse within the watershed is forested. There are no NPDES outfalls located within the 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. Typical of ecoregion 65f, Bear Head Creek at BEHE-1 is a low-gradient stream with predominantly sand and organic matter substrates. Overall habitat quality was categorized as *fair*.

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 south Alabama streams and rivers. Each site is placed in one of six levels ranging from 1, or natural, to 6, or highly altered.

Metric results indicated the macroinvertebrate community to be in *fair-good* condition (Table 4).

Table 1. Summary of general watershed characteristics: BEHE-1 (2018)

Watershed Characteristics	
Basin	Blackwater
Drainage Area (mi²)	4.1
Ecoregion^a	65f
Assessment Unit	AL03140104-0103-500
Use Class	F&W
AU Category	1
12-digit Hydrologic Unit Code (HUC)	031401040103
Landuse Categories (2011 National Land Cover Dataset)	
Open Water (%)	0.1
Wetland, Total (%)	0.9
Wetlands, Woody (%)	0.9
Forested, Total (%)	70.2
Forested, Deciduous (%)	2.2
Forested, Evergreen (%)	62.4
Forested, Mixed (%)	5.5
Shrub/Scrub (%)	4.1
Grassland/Herbaceous (%)	3.8
Pasture/Hay (%)	1.7
Crops, Cultivated (%)	15.1
Developed, Total (%)	4.1
Developed, Open Space (%)	3.1
Developed, Low Intensity (%)	1.0
Population/km (2010 US Census)	3
Roads	
Road Density	0.9
# Road Crossings per Stream km	0.5
Watershed Disturbance Score*	123
Watershed Disturbance Category*	4

^a Southern Pine Plains And Hills

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

Table 2. Physical characteristics of Bear Head Creek at BEHE-1, April 24, 2019.

Physical Characteristics	
Width (ft)	14
Canopy Cover	Mostly Shaded
Depth (ft)	
Run	0.5
Pool	0.5
% of Reach	
Run	80
Pool	20
% Substrate	
Mud/Muck	10
Sand	50
Silt	10
Organic Matter	30

Table 3. Results of the habitat assessment survey conducted on Bear Head Creek at BEHE-1, April 24, 2019.

Habitat Survey	% Max Score	Rating
Instream Habitat Quality	43	Marginal (30-49.999)
Sediment Deposition	33	Marginal (30-49.999)
Bank Vegetative Stability	59	Sub-optimal (55-74.999)
Sinuosity	40	Marginal (30-49.999)
Riparian Zone Measurements	43	Marginal (30-49.999)
Habitat Assessment Score	81	
% Maximum Score	45	Fair (41-63.999)

Table 4. Results of the macroinvertebrate survey conducted on Bear Head Creek at BEHE-1, April 24, 2019.

Macroinvertebrate Assessment	Results
Taxonomic richness and diversity metrics	
Taxa Count	55
# rare and highly sensitive taxa	3
# sensitive taxa	17
# sensitive EPT taxa	9
Percent taxon metrics	
% rare and highly sensitive taxa	5
% sensitive taxa	31
% sensitive EPT taxa	16
% highly tolerant taxa	4
Percent individual metrics	
% rare and highly sensitive individuals	4
% sensitive individuals	21
% sensitive EPT individuals	8
% tolerant individuals	0
WMB-I Survey Score	
WMB-I Survey Rating	Fair-good (3.5-3.849)

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. In situ measurements and water samples were collected during April, June, August and October of 2019 to help identify any stressors to the biological communities and to help characterize the reach.

In situ parameters, which were measured during each site visit, indicated that water quality in Bear Head Creek at BEHE-1 was not meeting its *Fish & Wildlife* water use classification. Stream pH values were below 6.0 standard units (s.u.) during all five sample collections, but streams in this region of the state are naturally acidic due to blackwater conditions. Dissolved oxygen values were below all verified ecoregional reference reach data in ecoregion 65f.

SUMMARY

Bioassessment results indicated the macroinvertebrate community to be in *fair-good* condition. Overall habitat quality was categorized as *fair*. Stream pH values were below 6.0 standard units (s.u.) during all five sample collections, but streams in this region of the state are naturally acidic. Dissolved oxygen values were below all verified ecoregional reference reach data in ecoregion 65f.

Table 5. Summary of water quality data collected 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.

BEHE-1 AL03140104-0103-500	N	Min	Max	Med	Avg	SD	E	10thP	90thP
Physical									
Temperature (°C)	5	18.9	24.9	22.7	22.0	2.8		18.9	24.9
Turbidity (NTU)	5	2.2	4.8	2.6	3.1	1.1		2.2	4.8
Total Dissolved Solids (mg/L)	4	5.0	33.0	16.5	17.8	11.9		5.0	33.0
Total Suspended Solids (mg/L)	4	1.0	6.0	1.0	2.1	2.6		0.5	6.0
Specific Conductance (µmhos/cm)	5	13.7	16.8	15.5	15.3	1.2		13.7	16.8
Hardness (mg/L)	4	0.9	2.2	1.8	1.6	0.6		0.9	2.2
Alkalinity (mg/L)	4	0.7	0.9	0.5	0.6	0.3		0.3	0.9
Color (CU)	4	25	48	37	37	9		25	48
Measured Stream Flow (cfs)	5	0.8	7.6	1.4	2.5	2.9		0.8	7.6
Chemical									
Dissolved Oxygen (mg/L)	5	6.5 ^M	7.8	7.1	7.0	0.5		6.5	7.8
pH (SU)	5	5.1	5.9	5.3 ^C	5.3	0.4	5	5.1	5.9
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	<0.003	0.008	0.004	0.004	0.003		0.002	0.008
Total Kjeldahl Nitrogen (mg/L)	4	<0.200	1.750	0.100	0.512	0.825		0.100	1.750
Total Nitrogen (mg/L)	4	<0.102	1.755	0.106	0.517	0.825		0.102	1.755
Dis Reactive Phosphorus (mg/L)	4	<0.005	<0.005	0.002	0.002	0.000		0.002	0.002
Total Phosphorus (mg/L)	4	0.009	0.012	0.010	0.010	0.001		0.009	0.012
TOC (mg/L)	4	2.4	7.7	4.4	4.7	2.2		2.4	7.7
Dissolved Organic Carbon (mg/L)	4	2.1	6.8	3.9	4.2	2.0		2.1	6.8
CBOD-5 (mg/L)	4	<2.0	<2.0	1.0	1.0	0.0		1.0	1.0
COD (mg/L)	4	13.6	24.1	14.8	16.8	4.9		13.6	24.1
Chlorides (mg/L)	4	2.6	2.7	2.7	2.7	0.1		2.6	2.7
Sulfate (mg/L)	4	0.36	1.19	0.72	0.75	0.38		0.36	1.19
Total Metals									
Aluminum (T) (mg/L)	4	0.115	0.279	0.153	0.175	0.072		0.115	0.279
Iron (T) (mg/L)	4	0.625	1.000	0.770	0.791	0.184		0.625	1.000
Manganese (T) (mg/L)	4	<0.004	0.017	0.008	0.009	0.006		0.002	0.017
Dissolved Metals									
Aluminum (mg/L)	4	0.074	0.158	0.088	0.102	0.039		0.074	0.158
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	0.220	0.383	0.324	0.313	0.077		0.220	0.383
Lead (µg/L)	4	<0.697	<0.697	0.348	0.348	0.000		0.348	0.348
Manganese (mg/L)	4	<0.004	0.012	0.004	0.005	0.005		0.002	0.012
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	<1.00	2.14	0.78	1.05	0.77		0.50	2.14
E. coli (MPN/DL)	4	51.2	260.3	133.6	144.6	102.6		51.2	260.3

C=F&W criterion violated; E=# samples that exceeded criteria; J=estimate; M=value >90% of all verified ecoregional reference reach data collected in the ecoregion 65f; N=# samples.

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