

# 2014 Monitoring Summary



## Bear Head Creek at Forest Road 311D (Escambia County) (31.11202/-86.71293)

### BACKGROUND

The Alabama Department of Environmental Management (ADEM) monitored Bear Head Creek as a potential Ecoregional Reference Site, based on landuse data. Reference sites represent best-attainable conditions and provide background data used for comparison with other streams in the same ecoregion. Additionally, ADEM included the Bear Head Creek watershed for biological and water quality monitoring as part of the 2014 Assessment of the Southeast Alabama (SEAL) River Basins. The objectives of the SEAL Basin Assessments were to assess the biological integrity of each monitoring site and to estimate overall water quality within the SEAL basin group.



Figure 1. Bear Head Creek at BEHE-1, May 7, 2014.

### WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Bear Head Creek is a *Fish & Wildlife (F&W)* stream located within the *Southern Pine Plains and Hills* sub-ecoregion (65f). It drains approximately four square miles in Conecuh National Forest before flowing into Bear Creek and the Blackwater River. Based on the 2011 National Land Cover Dataset, landuse within the watershed is primarily forest (70%) and cultivated crops. Population density is relatively low and less than five percent of the area is developed. As of April 1, 2016, there are no NPDES permitted outfalls active 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 in Bear Head Creek at BEHE-1. Instream substrates were dominated by sand, with abundant organic matter for macroinvertebrate colonization (Figure 1). The reach was characterized by low, stable banks, and good riparian cover and shade. Algal and aquatic plant growth was minimal. Habitat quality and availability within the reach were rated *sub-optimal* for supporting macroinvertebrate communities.

### 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 community tolerance are 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*. The macroinvertebrate survey conducted at BEHE-1 rated the site as a 3-, or *good-fair* (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
<b>Basin</b>		Blackwater River
<b>Drainage Area (mi<sup>2</sup>)</b>		4
<b>Ecoregion<sup>a</sup></b>		65F
<b>% Landuse<sup>b</sup></b>		
Open water		<1%
Wetland	Woody	1%
Forest	Deciduous	2%
	Evergreen	62%
	Mixed	6%
Shrub/scrub		4%
Grassland/herbaceous		4%
Pasture/hay		2%
Cultivated crops		15%
Development	Open space	3%
	Low intensity	1%
	Moderate intensity	<1%
<b>Population/km<sup>2c</sup></b>		3

a.Southern Pine Plains & Hills

b.2011 National Land Cover Dataset

c.2010 US Census

Table 2. Physical characteristics of Bear Head Creek at BEHE-1, May 7, 2014.

Physical Characteristics		
<b>Width (ft)</b>		15
<b>Canopy cover</b>		Mostly Shaded
<b>Depth (ft)</b>	Run	0.7
	Pool	1.5
<b>% of Reach</b>	Run	70
	Pool	30
<b>% Substrate</b>	Mud/Muck	2
	Sand	45
	Silt	5
	Organic Matter	48

**Table 3.** Results of the habitat assessment conducted on Bear Head Creek at BEHE-1, May 7, 2014.

Habitat Assessment	% Maximum Score	Rating
Instream Habitat Quality	44	Marginal (31-<55)
Sediment Deposition	70	Sub-optimal (55-79)
Sinuosity	48	Marginal (31-<55)
Bank and Vegetative Stability	85	Optimal (>79)
Riparian Buffer	100	Optimal (>84)
<b>Habitat Assessment Score</b>	<b>124</b>	
<b>% Maximum Score</b>	<b>69</b>	<b>Sub-optimal (57-80)</b>

**Table 4.** Results of the macroinvertebrate bioassessment conducted in Bear Head Creek at BEHE-1, May 7, 2014.

Macroinvertebrate Assessment		Results
<b>Taxa richness and diversity measures</b>		
	Total # Taxa	59
	# EPT taxa	19
	# Highly-sensitive and Specialized Taxa	6
<b>Taxonomic composition measures</b>		
	% EPC taxa	22
	% Trichoptera & Chironomidae Taxa	53
	% EP Individuals	8
	% Chironomidae Individuals	80
	% Individuals in Dominant 5 Taxa	62
<b>Functional feeding group</b>		
	% Collector-Filterer Individuals	30
	% Tolerant Filterer Taxa	10
<b>Community tolerance</b>		
	# Sensitive EPT	8
	% Sensitive taxa	25
	% Nutrient Tolerant individuals	41
	<b>WMB-I Assessment Score</b>	<b>3-</b>
	<b>WMB-I Assessment Rating</b>	<b>Good-Fair</b>

**WATER CHEMISTRY**

Results of water chemistry analyses are presented in Table 5. In situ measurements and water samples were collected monthly, March through October of 2014, to help identify any stressors to the biological communities. Additionally, field parameters were collected during the macroinvertebrate assessment on May 7. Stream pH was low, but typical of tannic, coastal plain streams. In April and August, median values for dissolved zinc were above the hardness-dependent aquatic life use criterion for F&W streams, but not higher than expected for streams in sub-ecoregion 65f. No organic samples were collected.

**SUMMARY**

The habitat at Bear Head Creek at BEHE-1 was assessed and found to be *sub-optimal* for supporting healthy and diverse aquatic macroinvertebrate communities. The overall macroinvertebrate community condition was rated as *good-fair*. However, monitoring of Bear Head Creek at BEHE-1 should continue to ensure that conditions remain stable at the site, and to verify its status as a potential reference reach for ecoregion 65f.

**Table 5.** Summary of water quality data collected March through October, 2014. 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	Median	Avg	SD	Q	E
<b>Physical</b>								
Temperature (°C)	9	11.4	23.4	20.4	18.8	4.6		
Turbidity (NTU)	9	1.5	7.8	2.8	3.3	1.9		
Total Dissolved Solids (mg/L)	8	4.0	40.0	27.5	24.9	14.3		
<sup>J</sup> Total Suspended Solids (mg/L)	8	< 1.0	5.0	0.8	1.8	1.8		
Specific Conductance (µmhos)	9	14.4	22.6	15.5	16.4	2.6		
Hardness (mg/L)	4	1.9	4.1	2.8	2.9	0.9		
Alkalinity (mg/L)	8	< 0.9	< 1.2	0.5	0.7	0.3		
Stream Flow (cfs)	9	1.3	15.4	4.1	6.0	5.1		
Stream Flow during Sampling (cfs)	9	1.3	15.4	4.1	6.0	5.1		
<b>Chemical</b>								
Dissolved Oxygen (mg/L)	9	5.5	9.1	6.7	7.0	1.1		
pH (su)	9	4.8	<sup>C</sup> 5.6	<sup>C</sup> 5.2	5.2	0.2		9
Ammonia Nitrogen (mg/L)	8	< 0.006	< 0.010	0.003	0.004	0.001		
<sup>J</sup> Nitrate+Nitrite Nitrogen (mg/L)	8	< 0.002	0.006	0.002	0.003	0.002		
<sup>J</sup> Total Kjeldahl Nitrogen (mg/L)	8	< 0.049	0.431	0.246	0.201	0.146		
<sup>J</sup> Total Nitrogen (mg/L)	8	< 0.026	< 0.432	0.248	0.204	0.145		
Dissolved Reactive Phosphorus (mg/L)	8	< 0.003	0.007	0.004	0.004	0.002		
<sup>J</sup> Total Phosphorus (mg/L)	8	0.007	0.026	0.012	0.015	0.006		
CBOD-5 (mg/L)	8	< 2.0	< 2.0	1.0	1.0	0.0		
COD (mg/L)	8	< 1.6	31.3	13.1	15.2	10.9		
TOC (mg/L)	8	2.6	9.8	5.3	5.9	2.8		
Chlorides (mg/L)	8	2.1	2.8	2.6	2.6	0.2		
<b>Total Metals</b>								
<sup>J</sup> Aluminum (mg/L)	4	0.116	0.551	0.364	0.349	0.190		
Iron (mg/L)	4	0.445	0.933	0.574	0.632	0.216		
<sup>J</sup> Manganese (mg/L)	4	0.014	0.066	0.044	0.042	0.022		
<b>Dissolved Metals</b>								
<sup>J</sup> Aluminum (µg/L)	4	0.073	0.424	0.286	<sup>M</sup> 0.267	0.152		
Antimony (µg/L)	4	< 0.2	< 0.4	0.1	0.1	0.1		
<sup>J</sup> Arsenic (µg/L)	4	< 0.2	0.3	0.1	0.2	0.1		
Cadmium (µg/L)	4	< 0.246	< 0.390	0.123	0.141	0.036		
<sup>J</sup> Chromium (µg/L)	4	0.253	0.785	0.606	0.562	0.234		
<sup>J</sup> Copper (mg/L)	4	< 0.0003	0.001	<sup>S</sup> 0.0004	0.0005	0.000	1	
Iron (mg/L)	4	0.306	0.586	0.398	0.422	0.120		
<sup>J</sup> Lead (µg/L)	4	< 0.2	0.8	<sup>S</sup> 0.2	0.3	0.3	1	
<sup>J</sup> Manganese (mg/L)	4	0.011	0.066	0.042	<sup>M</sup> 0.040	0.023		
<sup>J</sup> Nickel (mg/L)	4	0.0002	< 0.0006	0.0004	0.0004	0.000		
Selenium (µg/L)	4	< 0.4	< 0.5	0.2	0.2	0.0		
Silver (µg/L)	4	< 0.252	< 0.460	0.126	0.152	0.052		
Thallium (µg/L)	4	< 0.2	< 0.6	0.1	0.2	0.1		
<sup>J</sup> Zinc (mg/L)	4	0.005	<sup>S</sup> 0.012	<sup>S</sup> 0.005	0.007	0.003	2	
<b>Biological</b>								
Chlorophyll a (µg/L)	8	< 0.10	19.22	0.88	4.75	7.48		
<sup>J</sup> E. coli (col/100 mL)	8	17	387	140	153	119		

C=F&W criterion exceeded; J=estimate; E=# of samples that exceeded criteria; M=values greater than the 90th percentile of all verified reference reach data collected in ecoregion 65f; N=# of samples; Q=# of uncertain criterion exceedances; S=exceeds hardness-adjusted aquatic life use criterion for F&W streams.

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