

2015 Monitoring Summary



Bennett Mill Creek at Henry County Road 47 (31.52578/-85.07162)

BACKGROUND

In 2014, Bennett Mill Creek was one of the streams the Alabama Department of Environmental Management (ADEM) monitored as a candidate for “best attainable condition” reference watershed for comparison with streams throughout the Southern Hilly Gulf Coastal Plain ecoregion (65D).

Based on the water quality data collected in 2014, Bennett Mill Creek, from its confluence with the Chattahoochee river upstream to its source, was added to Alabama’s 2016 §303(d) List of Impaired Water Bodies for exceeding the *E. coli* criterion for *Fish and Wildlife (F&W)* streams. Follow-up monitoring was conducted in 2015.



Figure 1. Bennett Mill Creek at BMCH-1, May 5, 2015.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Bennett Mill Creek is a small *Fish & Wildlife (F&W)* stream in Henry County. It is a tributary of the Chattahoochee River. Based on the 2011 National Land Cover Dataset, land use within the watershed is primarily forest (56%) with some shrub/scrub. The majority of the watershed is unpopulated and less than five percent of the area is developed. As of April 1, 2016, no NPDES permitted outfalls are active in 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. Bennett Mill Creek at BMCH-1 is a medium gradient riffle-run stream (Figure 1). Instream substrates were dominated by sand, with some gravel and organic matter for macroinvertebrate colonization. Overall habitat quality was categorized as *marginal* for supporting macroinvertebrate communities.

BIOASSESSMENT RESULTS

Benthic macroinvertebrate communities were sampled using ADEM’s Intensive Multi-habitat Bioassessment methodology (WMB-I). The WMB-I uses measures of taxonomic richness, community composition, and community tolerance to assess the overall health of the macroinvertebrate community in comparison to conditions expected in Alabama Coastal Plain 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 in Bennett Mill Creek at BMCH-1 to be in *good* condition (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin	Chattahoochee River	
Drainage Area (mi ²)	7	
Ecoregion ^a	65D	
% Landuse ^b		
Open water		<1%
Wetland	Woody	<1%
Forest	Deciduous	9%
	Evergreen	30%
	Mixed	17%
Shrub/scrub		22%
Grassland/herbaceous		6%
Pasture/hay		2%
Cultivated crops		11%
Development	Open space	3%
	Low intensity	<1%
	Moderate intensity	<1%
Population/km ^{2c}	4	

a. Southern Hilly Gulf Coastal Plain

b. 2011 National Land Cover Dataset

c. 2010 US Census

Table 2. Physical characteristics of Bennett Mill Creek at BMCH-1, May 5, 2015.

Physical Characteristics		
Width (ft)	12	
Canopy Cover	Shaded	
Depth (ft)	Riffle	0.5
	Run	0.5
	Pool	1.0
% of Reach	Riffle	10
	Run	85
	Pool	5
% Substrate	Bedrock	2
	Gravel	20
	Sand	70
	Silt	5
	Organic Matter	3

Table 3. Results of the habitat assessment conducted in Bennett Mill Creek at BMCH-1, May 5, 2015.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	47	Marginal (31-54)
Sediment Deposition	31	Marginal (31-54)
Riffle Frequency	65	Sub-optimal (55-79)
Bank and Vegetative Stability	49	Marginal (31-57)
Riparian Buffer	88	Optimal (>84)
Habitat Assessment Score	108	
% Maximum Score	54	Marginal (31-56)

Table 4. Results of the macroinvertebrate bioassessment conducted in Bennett Mill Creek at BMCH-1, May 5, 2015.

Macroinvertebrate Assessment		Results
Taxa richness and diversity measures		
	Total # Taxa	46
	# EPT taxa	15
	# Highly-sensitive and Specialized Taxa	7
Taxonomic composition measures		
	% EPC taxa	39
	% EPT minus Baetidae and Hydropsychidae	15
	% Chironomidae Individuals	41
	% Dominant Taxon	27
	% Individuals in Dominant 5 Taxa	71
Functional feeding group		
	# Collector Taxa	23
	% Tolerant Filterer Taxa	4
Community tolerance		
	# Sensitive EPT	8
	% Sensitive taxa	35
	% Nutrient Tolerant individuals	14
	WMB-I Assessment Score	3
	WMB-I Assessment Rating	Good

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. In situ measurements and water samples were collected monthly March through October 2015 to help identify any stressors to the biological communities. In situ parameters were also measured during the organics sampling on April 28 and the macroinvertebrate assessment on May 5. The *F&W* human health single maximum criterion for *E. coli* concentrations was exceeded on three out of eight sampling events. Median nitrate-nitrite nitrogen was slightly elevated compared to verified reference reach data collected in ecoregion 65D. Organics results were all less than MDL except for Atrazine, a commonly found herbicide. Dissolved arsenic exceedances are uncertain. All other metals results were within expected ranges.

SUMMARY

ADEM monitored Bennett Mill Creek at BMCH-1 in 2015 to determine the suitability of classifying it a “best-attainable” condition reference watershed. Landuse and population density categorize Bennett Mill Creek among the least-disturbed watersheds in Alabama’s Chattahoochee river basin. Water quality data indicates the stream to have slightly elevated concentrations of nitrate-nitrite nitrogen. Also, *E. coli* counts exceeded the *F&W* human health criterion in the summer. However, bioassessment results show the macroinvertebrate community to be in *good* condition in spite of degraded water quality and marginal habitat conditions.

Monitoring of Bennett Mill Creek at BMCH-1 should continue to ensure that conditions remain stable at the site and to verify its status as a reference reach for ecoregion 65D.

Table 5. Summary of water quality data collected during March through October 2015. 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	Q	E
Physical								
Temperature (°C)	10	17.2	24.6	20.2	20.6	2.7		
Turbidity (NTU)	10	3.3	26.2	6.3	9.0	7.2		
^J Total Dissolved Solids (mg/L)	8	31.0	47.0	41.0	40.5	5.8		
^J Total Suspended Solids (mg/L)	8	3.0	38.0	3.5	11.0	12.8		
Specific Conductance (µmhos/cm)	10	41.6	49.2	44.9	44.9	2.7		
Hardness (mg/L)	4	18.7	20.0	19.3	19.3	0.5		
Alkalinity (mg/L)	8	9.6	12.6	10.9	11.0	1.1		
Monthly Stream Flow (cfs)	10	2.8	8.3	5.6	5.7	2.0		
Measured Stream Flow (cfs)	10	2.8	8.3	5.6	5.7	2.0		
Chemical								
Dissolved Oxygen (mg/L)	10	8.2	10.0	9.1	9.1	0.6		
pH (SU)	10	6.8	7.4	7.1	7.1	0.2		
Ammonia Nitrogen (mg/L)	8	< 0.007	0.010	0.005	0.005	0.001		
Nitrate+Nitrite Nitrogen (mg/L)	8	0.371	0.554	0.472 ^M	0.456	0.060		
^J Total Kjeldahl Nitrogen (mg/L)	8	< 0.064	0.631	0.208	0.262	0.212		
^J Total Nitrogen (mg/L)	8	< 0.507	1.029	0.619	0.718	0.211		
^J Dis Reactive Phosphorus (mg/L)	8	0.007	0.014	0.010	0.011	0.002		
Total Phosphorus (mg/L)	8	0.020	0.051	0.024	0.031	0.011		
CBOD-5 (mg/L)	8	< 2.0	< 2.0	1.0	1.0	0.0		
COD (mg/L)	7	4.1	19.8	14.3	12.8	5.6		
^J TOC (mg/L)	8	2.0	4.2	2.9	2.9	0.7		
Chlorides (mg/L)	8	2.7	3.5	3.2	3.1	0.2		
Atrazine (µg/L)	1	<			0.10			
Total Metals								
^J Aluminum (mg/L)	4	< 0.106	1.580	0.228	0.522	0.714		
Iron (mg/L)	4	0.273	1.580	0.500	0.713	0.599		
^J Manganese (mg/L)	4	< 0.004	0.051	0.028	0.027	0.020		
Dissolved Metals								
^J Aluminum (mg/L)	4	< 0.106	0.106	0.053	0.066	0.026		
Antimony (µg/L)	4	< 0.3	< 0.3	0.2	0.2	0.0		
^J Arsenic (µg/L)	4	0.3	< 0.4 ^H	0.4	0.4	0.0	3	
Cadmium (µg/L)	4	< 0.311	< 0.311	0.156	0.156	0.000		
^J Chromium (µg/L)	4	0.351	0.621	0.411	0.448	0.118		
^J Copper (µg/L)	4	< 0.218	0.405	0.293	0.275	0.128		
^J Iron (mg/L)	4	0.141	0.182	0.166	0.164	0.020		
Lead (µg/L)	4	< 0.4	< 0.4	0.2	0.2	0.0		
^J Manganese (mg/L)	4	< 0.004	0.048	0.005	0.015	0.022		
^J Nickel (µg/L)	4	< 0.460	0.678	0.400	0.427	0.232		
Selenium (µg/L)	4	< 0.4	< 0.4	0.2	0.2	0.0		
Silver (µg/L)	4	< 0.365	< 0.365	0.182	0.182	0.000		
Thallium (µg/L)	4	< 0.5	< 0.5	0.2	0.2	0.0		
^J Zinc (µg/L)	4	0.564	2.463	1.136	1.324	0.809		
Biological								
Chlorophyll a (mg/m ³)	8	< 0.10	2.14	0.50	0.71	0.63		
^J E. coli (MPN/DL)	8	172.3	3465.8 ^H	686.7	1264.4	1211.6	3	

H=*F&W* human health criterion exceeded; J=estimate; M=value greater than 90% median concentration of all verified reference reach data collected in ecoregion 65D; N=#of samples; Q=#of uncertain exceedances.

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