



Bear Creek at Pickens County Road 38 (33.36961/-87.90364)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Bear Creek watershed for biological and water quality monitoring as part of the [2006 Assessment of the Escatawpa, Mobile, and Tombigbee \(EMT\) River Basins](#). The objectives of the EMT Basin Assessments were to assess the biological integrity of each monitoring site and to estimate overall water quality within the EMT basin group. Due to drought conditions prevalent in 2006, macroinvertebrate samples and a habitat assessment were collected at this station on May 8, 2007.

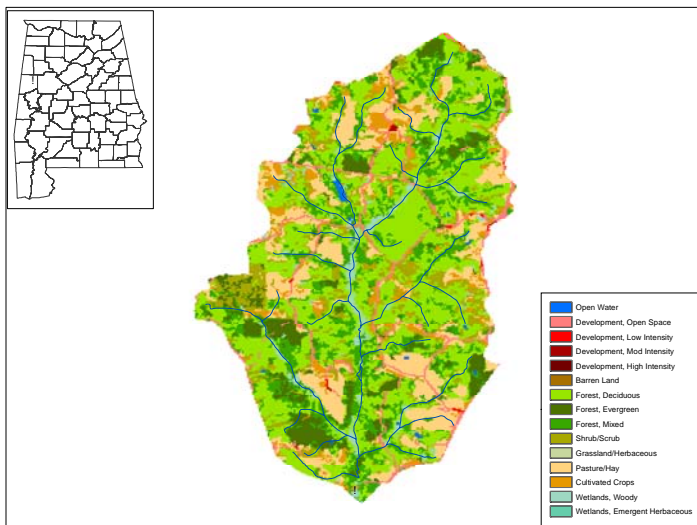


Figure 1. Landuse of Bear Creek at BRP-1.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Bear Creek is a [Fish & Wildlife \(F&W\)](#) stream located in the Fall Line Hills ecoregion (Table 1). Based on the 2000 National Land Cover dataset, landuse (Figure 1) within the watershed is primarily forested (61%). Population density is relatively low in this area. As of February 23, 2011, the Department has issued three NPDES permits in this watershed.

REACH CHARACTERISTICS

[General observations](#) (Table 2) and a [habitat assessment](#) (Table 3) were completed at BRP-1 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. Bear Creek at BRP-1 is a relatively shallow, low-gradient stream reach with a predominantly sand substrate. Overall habitat quality was characterized as *sub-optimal* for a Fall Line Hills stream. However, in-stream habitat was limited. The reach was also characterized by unstable and eroding banks.

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. Each metric is scored on a 100 point scale. The final score is the average of all individual metric scores. Metric results documented the presence of pollution intolerant taxa groups within the macroinvertebrate community, indicating good community condition (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin	Upper Tombigbee River	
Drainage Area (mi ²)	14	
Ecoregion ^a	65i	
% Landuse		
Open water		<1
Wetland	Woody	3
	Emergent herbaceous	<1
	Deciduous	38
Forest	Evergreen	7
	Mixed	16
Shrub/scrub		10
Grassland/herbaceous		<1
Pasture/hay		16
Cultivated crops		5
Development	Open space	4
	Low intensity	<1
	Moderate intensity	<1
Population/km ^{2b}		17
# NPDES Permits^c		
	TOTAL	3
	Construction Stormwater	2
	Industrial General	1

a. Fall Line Hills

b. 2000 US Census

c. #NPDES permits downloaded from ADEM's NPDES Management System database, 23 February 2011

Table 2. Physical characteristics of Bear Creek at BRP-1, May 8, 2007.

Physical Characteristics		
Width (ft)	15	
Canopy Cover	Shaded	
Depth (ft)	Run	1.0
	Pool	1.5
% of Reach	Run	80
	Pool	20
% Substrate	Clay	2
	Gravel	2
	Sand	78
	Silt	8
	Organic Matter	10

Table 3. Results of the habitat assessment conducted on Bear Creek at BRP-1, May 8, 2007.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	38	Poor <40
Sediment Deposition	59	Sub-optimal (53-65)
Sinuosity	73	Sub-optimal (65-84)
Bank and Vegetative Stability	45	Marginal (35-59)
Riparian Buffer	88	Sub-optimal (70-89)
Habitat Assessment Score	123	
% Maximum Score	56	Sub-optimal (53-65)

Table 4. Results of the macroinvertebrate bioassessment conducted in Bear Creek at BRP-1, May 8, 2007

Macroinvertebrate Assessment			
	Results	Scores	Rating
Taxa richness measures			
# EPT genera	12	48	Fair (38-56)
Taxonomic composition measures			
% Non-insect taxa	9	82	Fair (61.9-92.7)
% Plecoptera	11	54	Excellent (>52.8)
% Dominant taxa	22	69	Fair (47.1-70.5)
Functional composition measures			
% Predators	22	77	Excellent (>72.1)
Tolerance measures			
Beck's community tolerance index	9	41	Good (31.9-65.9)
% Nutrient tolerant organisms	17	88	Excellent (>88.1)
WMB-I Assessment Score	--	66	Good (57-78)

WATER CHEMISTRY

Results of water chemistry analyses collected in 2006 and 2007 are presented in Table 5. In 2006, [in situ measurements](#) and [water samples](#) were collected monthly, semi-monthly (metals), or quarterly (pesticides, atrazine, and semi-volatile organics) during March through October to help identify any stressors to the biological communities. The site was visited twice in 2007 to provide data during the same sampling period as the macroinvertebrate collection.

Dissolved mercury concentrations exceeded the chronic freshwater aquatic life use and human health criteria during one of eight sampling events. Median specific conductance, hardness, and nutrient (nitrate+nitrite nitrogen, total nitrogen) values were above background level based on ecoregional reference reach data. Organics were collected in May and September. Parameters were less than the minimal detection limit.

SUMMARY

As part of the [assessment process](#), ADEM will review the monitoring information presented in this report, along with all other available data.

The 2007 bioassessment results indicated the macroinvertebrate community in Bear Creek at BRP-1 to be in *good* condition. Overall habitat quality was categorized as *sub-optimal*. However, nutrient concentrations were elevated as compared to data from ADEM's least-impaired reference reaches in ecoregion 65i. Drought conditions may also have impacted conditions within the stream reach. Monitoring should continue to ensure that water quality and biological conditions remain stable.

Table 5. Summary of water quality data collected March-October, 2006 and May and July, 2007. Minimum (Min) and maximum (Max) values calculated using minimum detection limits (MDL). 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
Physical						
Temperature (°C)	10	12.2	24.9	20.1	20.2	4.0
Turbidity (NTU)	10	10.7	111.0	20.4	29.6	29.7
Total Dissolved Solids (mg/L)	8	17.0	81.0	46.5	47.8	17.7
Total Suspended Solids (mg/L)	8	7.0	103.0	11.0	24.1	32.8
Specific Conductance (µmhos)	10	32.0	55.8	49 ^G	47.3	7.1
Hardness (mg/L)	8	9.2	15.6	13.6 ^G	13.3	2.2
Alkalinity (mg/L)	8	6.4	14.1	11.8	10.1	2.8
Stream Flow (cfs)	9	2.8	26.8	4.2	10.3	9.1
Chemical						
Dissolved Oxygen (mg/L)	10	7.0	11.1	8.6	8.6	1.1
pH (su)	10	6.1	7.0	6.8	6.6	0.4
Ammonia Nitrogen (mg/L)	8	<0.015	0.096	0.023	0.030	0.031
Nitrate+Nitrite Nitrogen (mg/L)	8	0.187	0.553	0.304 ^M	0.346	0.135
Total Kjeldahl Nitrogen (mg/L)	8	0.251	0.954	0.592	0.585	0.202
Total Nitrogen (mg/L)	8	0.773	1.416	0.858 ^M	0.930	0.211
Dissolved Reactive Phosphorus (mg/L)	8	<0.004	0.013	0.007	0.007	0.004
Total Phosphorus (mg/L)	8	<0.100	<0.100	0.050	0.050	0.000
CBOD-5 (mg/L)	8	0.2	1.2	0.6	0.6	0.3
COD (mg/L)	4	8.9	56.0	12.4	22.4	22.5
TOC (mg/L)	5	3.8	6.1	4.1	4.7	1.1
Chlorides (mg/L)	8	2.9	5.3	4.3	4.1	0.8
Atrazine (µg/L)	2	<0.05	0.21	0.12	0.12	0.13
Total Metals						
Aluminum (mg/L)	8	0.099	2.090	0.216	0.502	0.665
Iron (mg/L)	8	2.340	4.100	2.825	2.988	0.639
Manganese (mg/L)	8	0.215	0.394	0.308	0.307	0.065
Dissolved Metals						
Aluminum (mg/L)	8	<0.050	0.068	0.025	0.030	0.015
Antimony (µg/L)	8	<10.0	<10.0	5.0	5.0	0.0
Arsenic (µg/L)	8	<10.0	<10.0	5.0	5.0	0.0
Cadmium (mg/L)	8	<0.015	<0.015	0.008	0.008	0.000
Chromium (mg/L)	8	<0.050	<0.050	0.025	0.025	0.000
Copper (mg/L)	8	<0.050	<0.050	0.025	0.025	0.000
Iron (mg/L)	8	0.383	0.860	0.496	0.541	0.156
Lead (µg/L)	7	<10.0	<10.0	5.0	5.0	0.0
Manganese (mg/L)	8	0.054	0.330	0.209	0.193	0.104
Mercury (µg/L)	6	<0.01	0.5 ^{AH}	0.1	0.1	0.2
Nickel (mg/L)	8	<0.050	<0.050	0.025	0.025	0.000
Selenium (µg/L)	8	<10.0	50.0	25.0	22.5	7.1
Silver (mg/L)	6	<0.05	<0.05	0.03	0.03	0.0
Thallium (µg/L)	6	<1.0	10.0	5.0	4.2	1.8
Zinc (mg/L)	8	<0.050	<0.050	0.025	0.025	0.000
Biological						
Chlorophyll a (µg/L)	8	<1	8.01	1.69	2.25	2.42
Fecal Coliform (col/100 mL)	8	68	440	158	197	129

A=F&W aquatic life use criterion exceeded; G=value higher than median concentration of all verified ecoregional reference reach data collected in the ecoregion 65i; H=F&W human health criterion exceeded; M=value >90% of all verified ecoregional reference reach data collected in the ecoregion

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