

# 2005 Monitoring Summary



Ecological Reference Reach

## Bear Creek at Adamsburg Road just off Dekalb Co Rd 127 near Ft. Payne (34.380094/-85.69789)

### BACKGROUND

Bear Creek is one of the streams the Alabama Department of Environmental Management (ADEM) monitors as a “best attainable condition” reference watershed for comparison with streams throughout the Piedmont ecoregion.

Additionally, Bear Creek was selected for biological and water quality monitoring as part of the 2005 Assessment of the Alabama, Coosa, and Tallapoosa (ACT) River Basins. The objectives of the ACT Basin Assessments were to assess the biological integrity of each monitoring site and to estimate overall water quality within the ACT basin group.

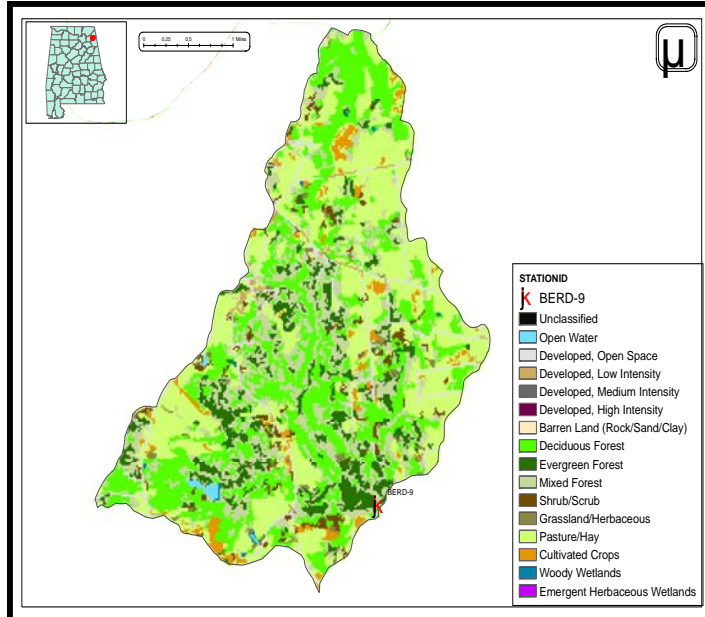
**Table 1.** Summary of watershed characteristics at BERD-9.

Watershed Characteristics	
Drainage Area (mi <sup>2</sup> )	12
Ecoregion <sup>a</sup>	68d
% Landuse	
Open water	<1
Wetland	Woody <1
Forest	Deciduous 28
	Evergreen 9
	Mixed 20
Shrub/scrub	3
Grassland/herbaceous	1
Pasture/hay	32
Cultivated crops	3
Development	Open space 4
	Low intensity 1
	Moderate intensity <1
Population/km <sup>2b</sup>	33
# NPDES Permits <sup>c</sup>	<b>TOTAL</b> 3
	Construction Stormwater 1
	Mining General Permit (old) 1
	Industrial Individual 1

a. Southern Table Plateaus

b. 2000 U.S. Census Data

c. # NPDES permits download from ADEM's NPDES Management System database, 9 Jun 2008



**Figure 1.** Sampling location and landuse within the Bear Creek watershed at BERD-9.

### WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Bear Creek is a small *Fish & Wildlife* (F&W) stream located in the Coosa River Basin (Fig. 1). The stream flows into Little River approximately three stream miles downstream of the assessment location. Landuse within the watershed is primarily forest (57%) and pasture (32%). Population density is low in this watershed (Table 1).

### REACH CHARACTERISTICS

General observations (Table 2) and habitat assessments (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. Bear Creek at BERD-9 is a high-gradient, riffle-run stream reach characterized primarily by bedrock, boulder, and cobble substrates. The diversity of stable habitat categorized the stream reach as *optimal* for biological communities.

**Table 2.** Physical characteristics at BERD-9, May 18, 2005.

Physical Characteristics	
Width (ft)	20
Canopy cover	Est. 50/50
Depth (ft)	
	Riffle 0.3
	Run 1.0
	Pool 1.5
% of Reach	
	Riffle 15
	Run 80
	Pool 5
% Substrate	
	Bedrock 40
	Boulder 20
	Cobble 20
	Gravel 10
	Sand 5
	Silt 2
	Organic Matter 3

### 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 an average of all individual metric scores. The final score indicated the biological community to be in *good* condition (Table 4).

**Table 3.** Results of habitat assessments conducted on Bear Creek, May 18, 2005.

Habitat Assessment (% Maximum Score)		Rating
Instream habitat quality	73	Optimal (> 70)
Sediment deposition	88	Optimal (> 70)
Sinuosity	83	Sub-optimal (65-84)
Bank and vegetative stability	88	Optimal (≥75)
Riparian buffer	95	Optimal (>90)
Habitat assessment score	201	
<b>% Maximum score</b>	<b>84</b>	<b>Optimal (&gt; 70)</b>

**Table 4.** Results of macroinvertebrate assessment conducted in Bear Creek, May 18, 2005.

Macroinvertebrate Assessment Results			
	Results	Scores	Rating
<b>Taxa richness measures</b>		<b>(0-100)</b>	
# Ephemeroptera (mayfly) genera	10	83	Good (71-85)
# Plecoptera (stonefly) genera	6	100	Excellent (>75)
# Trichoptera (caddisfly) genera	12	100	Excellent (>83)
<b>Taxonomic composition measures</b>			
% Non-insect taxa	3	88	Excellent (>87.1)
% Non-insect organisms	0	100	Excellent (>97)
% Plecoptera	3	16	Fair (13.1-19.7)
<b>Tolerance measures</b>			
Beck's community tolerance index	27	96	Excellent (>80.4)
<b>WMB-I Assessment Score</b>	<b>---</b>	<b>83</b>	<b>Good (72-86)</b>

## WATER CHEMISTRY

Results of water chemistry are presented in Table 5. In situ measurements and water samples were collected monthly, semi-monthly (metals), or quarterly (pesticides, herbicides (atrazine), and semi-volatile organics) during March through October of 2005 to help identify any stressors to the biological communities.

*In situ* parameters, which were measured during each site visit, indicated that Bear Creek at BERD-9 was meeting its *Fish and Wildlife* water use classification. Atrazine was elevated during one sampling event. Metals were generally low or less than detectable limits. Nutrients and suspended and dissolved solids were within ranges characteristic of the Southern Tables Plateaus ecoregion.

## CONCLUSIONS

To be used for comparison with other streams, "best-attainable" reference reaches must be representative of other streams in the streams ecoregion. Bear Creek at BERD-9 was typical of other streams in the Southern Tables Plateaus ecoregion, which are generally low to moderate gradient riffle-run streams with bedrock and boulder substrates. Habitat was rated as *optimal* for supporting a diverse macroinvertebrate community. Bioassessment results indicate the macroinvertebrate community to be in *good* condition. Comparison with historical bioassessment results show a steady improvement in biological conditions at the site since 2000.

**Table 5.** Summary of water quality data collected March-October, 2005. 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 for each parameter.

Parameter	N	Min	Max	Median	Avg	SD
<b>Physical</b>						
Temperature (°C)	9	10.3	23.8	21.0	18.6	5.0
Turbidity (NTU)	9	0.9	2.1	1.2	1.3	0.4
Total dissolved solids (mg/L)	7	15.0	218.0	38.0	65.4	70.7
Total suspended solids (mg/L)	7	2.0	7.0	4.0	4.3	2.1
Specific conductance (µmhos)	9	32.0	57.3	38.5	40.8	8.3
Hardness (mg/L)	5	9.8	17.7	13.1	13.4	3.6
Alkalinity (mg/L)	7	4.7	20.1	9.5	10.0	5.3
Stream Flow (cfs)	6	1.6	24.9	4.7	7.6	---
<b>Chemical</b>						
Dissolved oxygen (mg/L)	9	6.9	10.59	8.6	8.8	1.1
pH (su)	9	6.3	8.3	6.7	6.8	0.6
Ammonia Nitrogen (mg/L)	7	< 0.015	0.028	0.008	0.010	0.008
Nitrate+Nitrite Nitrogen (mg/L)	7	< 0.003	0.275	0.183	0.162	0.088
Total Kjeldahl Nitrogen (mg/L)	7	< 0.150	0.264	0.075	0.130	0.075
Total nitrogen (mg/L)	7	< 0.171	0.447	0.286	0.292	0.098
Dissolved reactive phosphorus (mg/L)	7	< 0.004	0.017	0.005	0.006	0.005
Total phosphorus (mg/L)	7	< 0.004	0.056	0.016	0.023	0.022
CBOD-5 (mg/L)	7	< 1.0	3.7	1.4	1.8	1.1
COD (mg/L)	3	< 2.0	< 2.0	1.0	1.0	0.0
Chlorides (mg/L)	7	4.1	5.1	4.2	4.5	0.5
Atrazine (µg/L)	1				0.03	---
<b>Total Metals</b>						
Aluminum (mg/L)	4	< 0.015	0.037	0.0123	0.017	---
Iron (mg/L)	4	0.091	0.187	0.16	0.150	---
Manganese (mg/L)	4	< 0.005	0.021	0.0078	0.010	---
<b>Dissolved Metals</b>						
Aluminum (mg/L)	4	< 0.015	0.149	0.0075	0.043	0.1
Antimony (µg/L)	4	< 2	< 2	1	1	---
Arsenic (µg/L)	4	< 10	< 10	5	5	---
Cadmium (mg/L)	4	< 0.005	< 0.005	0.003	0.003	---
Chromium (mg/L)	4	< 0.004	< 0.004	0.002	0.002	---
Copper (mg/L)	4	< 0.005	< 0.005	0.0025	0.003	---
Iron (mg/L)	4	< 0.005	0.129	0.078	0.072	0.1
Lead (µg/L)	4	< 2	< 2	1	1	---
Manganese (mg/L)	4	< 0.005	0.021	0.003	0.007	---
Mercury (µg/L)	4	< 0.3	< 0.3	0.15	0.15	---
Nickel (mg/L)	4	< 0.006	< 0.006	0.003	0.003	---
Selenium (µg/L)	4	< 10	< 10	5	5	---
Silver (mg/L)	4	< 0.003	< 0.003	0.002	0.002	---
Thallium (µg/L)	4	< 1	< 1	0.5	0.500	---
Zinc (mg/L)	4	< 0.006	< 0.006	0.003	0.003	---
<b>Biological</b>						
↓ Chlorophyll a (µg/L)	7	< 0.10	8.81	0.53	1.68	3.2
↓ Fecal Coliform (col/100 mL)	7	< 1	600	10	94	223

J=estimate; N=# samples

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