

2005 Monitoring Summary



Bear Creek at unnamed road, 3 mi upstream of Big Flat Creek, Monroe County (31.65196/ -87.33321)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Bear Creek watershed 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.

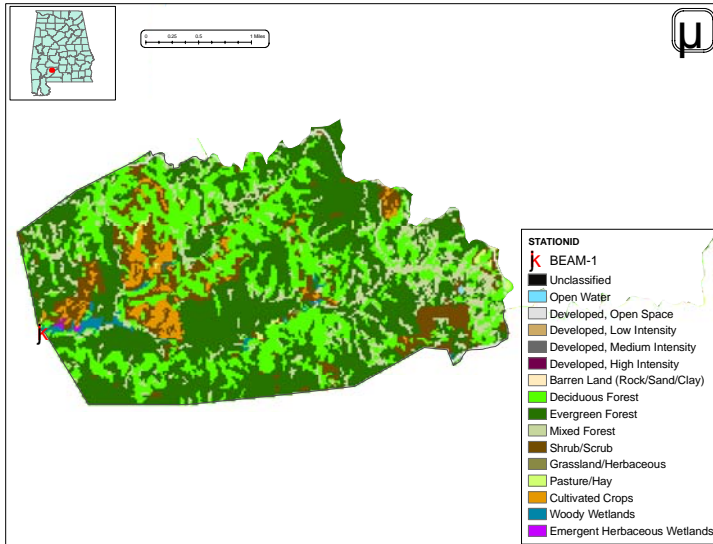


Figure 1. Sampling location and landuse within the Bear Creek watershed at BEAM-1.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Bear Creek is a small *Fish & Wildlife (F&W)* stream located in the Alabama River basin, near the city of Monroeville.

This watershed falls within the Burhstone/Lime Hills ecoregion, usually characterized by relatively high gradient streams and hard rock-bottoms. Landuse observed within the watershed is primarily forest (84%) including many pine plantations (Fig. 1). Point source pollution has little to no effect on this watershed. As of June 9, 2008, no NPDES permits have been issued.

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. Atypical to other streams within this ecoregion (65q), Bear Creek at BEAM-1 is a low-gradient, gravel/sand-bottomed stream. Overall habitat quality was categorized as *optimal*, however most parameters fell into the *sub-optimal* category. In June, the collectors noted the stream was impacted by extensive clear-cutting adjacent to the sampling location.

Table 1. Summary of watershed characteristics.

Watershed Characteristics	
Drainage Area (mi ²)	9
Ecoregion ^a	65q
% Landuse	
Open water	<1
Wetland	Woody 1
Forest	Deciduous 27
	Evergreen 46
	Mixed 11
Shrub/scrub	11
Grassland/herbaceous	<1
Pasture/hay	<1
Cultivated crops	3
Development	Open space 1
Population/km ^{2b}	40

a. Burhstone/Lime Hills

b. 2000 US Census Data

Table 2. Physical characteristics at BEAM-1, May 24, 2005.

Physical Characteristics	
Width (ft)	14
Canopy cover	Mostly Shaded
Depth (ft)	
Run	0.5
Pool	1.0
% of Reach	
Run	80
Pool	20
% Substrate	
Gravel	25
Sand	40
Silt	15
Organic Matter	10
Mud/Muck	10

BIOASSESSMENT RESULTS

Benthic macroinvertebrate communities were sampled using ADEM's Intensive Multi-habitat Bio-assessment 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 the score for each metric. Metric results indicated the macroinvertebrate community was characterized by Stoneflies and predators, indicating a *good* community condition (Table 4).

Table 3. Results of the habitat assessment conducted on May 24, 2005.

Habitat Assessment (% Maximum Score)		Rating
Instream habitat quality	56	Sub-optimal (53-65)
Sediment deposition	73	Optimal (>65)
Sinuosity	78	Sub-optimal (65-84)
Bank and vegetative stability	68	Sub-optimal (60-74)
Riparian buffer	84	Sub-optimal (70-90)
Habitat assessment score	148	
% Maximum score	67	Optimal (>65)

Table 4. Results of the macroinvertebrate bioassessment conducted on May 24, 2005.

Macroinvertebrate Assessment			
	Results	Scores	Rating
Taxa richness measures			
# EPT genera	11	44	Fair (37-56)
Taxonomic composition measures			
% Non-insect taxa	10	74	Good (56-78)
% Plecoptera	4	100	Excellent (>78)
% Dominant taxa	30	49	Fair (37-56)
Functional composition measures			
% Predators	28	81	Excellent (>78)
Tolerance measures			
Beck's community tolerance index	6	27	Poor (19-37)
% Nutrient tolerant organisms	47	39	Fair (37-56)
WMB-I Assessment Score	---	59	Good (56-78)

WATER CHEMISTRY

Results of water chemistry analyses 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. The maximum value for turbidity, 224 NTU, and total suspended solids, 221 mg/L, along with several other parameters, were reached following a high flow event in the watershed (June 29th). No established water quality criteria were exceeded during the intensive water quality sampling.

CONCLUSIONS

Bioassessment results indicated the macroinvertebrate community to be in *good* condition. Overall habitat quality was categorized as *optimal* although the substrate of Bear Creek at BEAR-1 differed from typical streams in this ecoregion. All median concentrations fell within expectations for this region. However, turbidity and total suspended solids were high following a high flow event. In June, the collectors noted the stream was impacted by extensive clear-cutting adjacent to the sampling location. This land disturbance may have contributed to the increased non-point source impacts on this stream.

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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. Metals results were compared to ADEM's chronic aquatic life use criteria adjusted for hardness.

Parameter	N	Min	Max	Median	Avg	SD
Physical						
Temperature (°C)	8	18.0	28.0	21.5	22.1	3.2
Turbidity (NTU)	9	5.9	224.0	9.5	39.5	71.0
Total dissolved solids (mg/L)	7	29.0	90.0	67.0	63.7	20.8
Total suspended solids (mg/L)	7	7.0	221.0	11.0	54.4	82.4
Specific conductance (µmhos)	8	28.0	60.4	49.0	46.3	13.6
Hardness (mg/L)	4	17.5	25.2	18.9	20.1	3.5
Alkalinity (mg/L)	7	4.4	22.2	13.4	13.1	6.4
Stream Flow (cfs)	9	2.4	50.7	5.0	12.1	---
Chemical						
Dissolved oxygen (mg/L)	8	5.2	9.3	8.0	7.8	1.4
pH (su)	8	6.2	7.7	7.0	7.0	0.5
Ammonia Nitrogen (mg/L)	7	< 0.015	0.080	0.008	0.023	0.028
Nitrate+Nitrite Nitrogen (mg/L)	7	< 0.003	0.035	0.018	0.015	0.013
Total Kjeldahl Nitrogen (mg/L)	7	< 0.150	0.556	0.075	0.192	0.187
Total nitrogen (mg/L)	7	< 0.076	0.574	0.103	0.208	0.187
Dissolved reactive phosphorus (mg/L)	7	< 0.004	0.016	0.004	0.007	0.006
Total phosphorus (mg/L)	7	< 0.004	0.102	0.037	0.048	0.033
CBOD-5 (mg/L)	6	< 1.0	2.3	1.1	1.2	0.7
^J Chlorides (mg/L)	7	4.4	9.8	4.9	5.6	1.9
Atrazine (µg/L)	2	< 0.05	0.05	0.03	0.06	0.00
Total Metals						
Aluminum (mg/L)	4	< 0.015	4.180	0.023	1.059	2.081
Iron (mg/L)	4	0.821	10.50	0.874	3.267	4.822
Manganese (mg/L)	4	0.019	0.404	0.037	0.124	0.187
Dissolved Metals						
Aluminum (mg/L)	4	< 0.015	0.091	0.008	0.028	0.042
Antimony (µg/L)	4	< 2.0	< 2.0	1.0	1.0	0.0
Cadmium (mg/L)	4	< 0.005	< 0.005	0.003	0.003	0.000
Chromium (mg/L)	4	< 0.004	< 0.004	0.002	0.002	0.000
Copper (mg/L)	4	< 0.005	< 0.005	0.003	0.003	0.000
Iron (mg/L)	4	0.092	0.240	0.122	0.144	0.068
Lead (µg/L)	4	< 2.0	< 2.0	1.0	1.0	0.0
Manganese (mg/L)	4	< 0.005	0.042	0.019	0.021	0.021
Mercury (µg/L)	4	< 0.30	< 0.30	0.15	0.15	0.00
Nickel (mg/L)	4	< 0.006	< 0.006	0.003	0.003	0.000
Selenium (µg/L)	3	< 10.0	< 10.0	5.0	5.0	0.0
Silver (mg/L)	4	< 0.003	< 0.003	0.002	0.002	0.000
Thallium (µg/L)	4	< 1.0	< 1.0	0.5	0.5	0.0
Zinc (mg/L)	4	< 0.006	< 0.006	0.003	0.003	0.000
Biological						
^J Chlorophyll a (µg/L)	7	0.53	7.48	1.60	2.31	2.48
^J Fecal Coliform (col/100 mL)	6	35	1800	170	644	823

^J = Estimate, N = Number of Samples,