

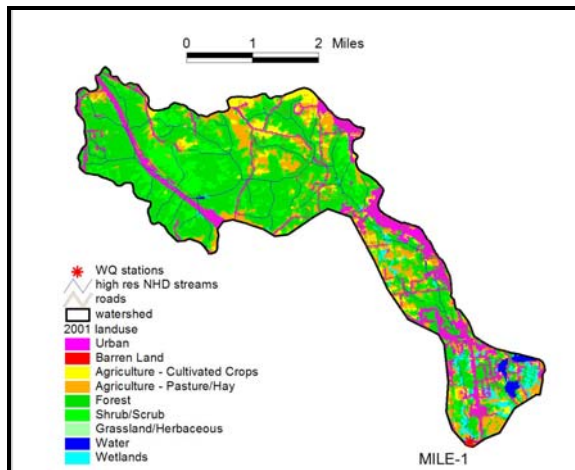
# 2005 Monitoring Summary



## Mill Creek at Elmore County Road 2120 (32.45541/-86.36339)

### BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Mill Creek watershed for biological and water quality monitoring as part of the 2005 Assessment of the Alabama, Coosa, and Tallapoosa (ACT) River Basins. One objective 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 Mill Creek watershed at MILE-1.

### WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Mill Creek is a small *Fish & Wildlife (F&W)* stream located near the city of Millbrook (Fig. 1). Landuse within the watershed is 47% forest, 18% pasture and cultivated crops, and 14% open and low-intensity development, primarily single-family residences. Interstate 65 runs through the upper reaches of the watershed.

### 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. Mill Creek at MILE-1 is a low-gradient, sand-bottomed stream in the Alabama River floodplain. The presence of wetland and swamp areas are characteristic of streams in the Southeastern Floodplains and Low Terraces. Overall habitat quality was categorized as *marginal* due to sedimentation, bank erosion, and a lack of stable in-stream habitat.

### 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 the score for each metric. Metric results indicated the macroinvertebrate community to be characterized by pollution-tolerant taxa groups, indicating *poor* community condition (Table 4).

**Table 1.** Summary of watershed characteristics.

Physical Characteristics	
Drainage Area (mi <sup>2</sup> )	10
Ecoregion <sup>a</sup>	65p
% Landuse	
Open water	<1
Wetland	Woody 2 Emergent herbaceous <1
Forest	Deciduous 26 Evergreen 7 Mixed 14
Shrub/scrub	18
Pasture/hay	12
Cultivated crops	6
Development	Open space 10 Low intensity 4 Moderate intensity 1 High intensity <1
Population/km <sup>2</sup> <sup>b</sup>	103
# NPDES Permits <sup>c</sup>	<b>TOTAL</b> 43
Construction Stormwater	23
Mining General Permit (old)	19
Industrial General	1

a. Southeastern Flood Plains and Low Terraces

b. 2000 US Census data

c. # NPDES permits in ADEM's NPDES Management System database, 9 June 2008.

**Table 2.** Physical characteristics at MILE-1, June 24, 2005.

Physical Characteristics	
Width (ft)	15
Canopy cover	Shaded
Depth (ft)	Run 2.0 Pool 1.0
% of Reach	Run 80 Pool 20
% Substrate	Gravel 5 Sand 83 Silt 5 Detritus 7

**Table 3.** Results of the habitat assessment conducted June 24, 2005.

Habitat Assessment (% Maximum Score)		Rating
Instream habitat quality	46	Marginal (40-52)
Sediment deposition	44	Marginal (41-58)
Sinuosity	38	Poor (<45)
Bank and vegetative stability	41	Marginal (45-64)
Riparian buffer	83	Sub-optimal (70-90)
Habitat assessment score	116	
<b>% Maximum score</b>	<b>53</b>	<b>Marginal (41-58)</b>

**Table 4.** Results of the macroinvertebrate bioassessment conducted June 24, 2005.

Macroinvertebrate Assessment			
	Results	Scores	Rating
<b>Taxa richness measures</b>			
# EPT genera	7	28	Poor (19-37)
<b>Taxonomic composition measures</b>			
% Non-insect taxa	8	86	Fair (61.8-92.7)
% Plecoptera	2	1	Very Poor (<1.86)
% Dominant taxa	31	47	Poor (23.5-47.0)
<b>Functional composition measures</b>			
% Predators	3	1	Very Poor (<15.1)
<b>Tolerance measures</b>			
Beck's community tolerance index	4	18	Poor (10.6-21.2)
% Nutrient tolerant organisms	69	1	Very Poor (<25.4)
<b>WMB-I Assessment Score</b>	<b>---</b>	<b>26</b>	<b>Poor (19-37)</b>

## 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 fecal coliform count was >2,000 colonies/100 mL in one of 7 (14%) samples collected (July 27th), above water quality criteria for its *Fish & Wildlife* use classification (stream flow=12.0 cfs). Median values of nutrients (nitrate+nitrite-nitrogen, ammonia, total phosphorus), chlorides, total and suspended solids, total aluminum and total and dissolved iron were above values expected in this ecoregion.

## CONCLUSIONS

Bioassessment results indicated the macroinvertebrate community in Mill Creek at MILE-1 to be in *poor* condition, below aquatic life use criteria for its *Fish & Wildlife* use classification. Results of other data collected during 2005 suggest sedimentation, nutrient enrichment, and elevated metals to be potential causes of the deteriorated biological conditions.

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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
<b>Physical</b>						
Temperature (°C)	8	13.0	28.0	21.5	20.3	6.1
Turbidity (NTU)	8	8.2	19.3	11.7	13.2	4.2
Total dissolved solids (mg/L)	7	32.0	73.0	53.0 <sup>M</sup>	54.0	15.7
Total suspended solids (mg/L)	7	10.0	23.0	16.0 <sup>M</sup>	16.4	4.3
Specific conductance (µmhos)	8	32.6	324	38.8	74.5	100.9
Hardness (mg/L)	4	8.7	10.4	9.7	9.6	0.9
Alkalinity (mg/L)	7	8.2	11.7	9.4	9.5	1.2
Stream Flow (cfs)	8	7.2	12.8	10.9	10.7	---
<b>Chemical</b>						
Dissolved oxygen (mg/L)	8	7.2	10.1	8.4	8.5	1.2
pH (su)	8	6.0	7.1	6.7	6.6	0.4
Ammonia nitrogen (mg/L)	7	< 0.015	< 0.015	0.008 <sup>M</sup>	0.008	0.000
Nitrate+nitrite nitrogen (mg/L)	7	0.262	0.410	0.315 <sup>M</sup>	0.318	0.051
Total Kjeldahl nitrogen (mg/L)	7	< 0.150	0.447	0.075	0.128	0.141
Total nitrogen (mg/L)	7	0.337	0.762	0.399	0.446	0.148
Dissolved reactive phosphorus (mg/L)	7	< 0.004	0.009	0.005	0.005	0.003
Total phosphorus (mg/L)	7	0.006	0.073	0.045 <sup>M</sup>	0.042	0.025
CBOD-5 (mg/L)	6	< 1.0	4.1	1.4	2.1	1.4
Chlorides (mg/L)	6	3.8	5.9	5.3 <sup>M</sup>	5.2	0.8
Atrazine (µg/L)	2	< 0.05	< 0.05	0.025	0.025	0.0
<b>Total Metals</b>						
Aluminum (mg/L)	3	< 0.015	0.153	0.146	0.102	0.1
Iron (mg/L)	3	1.30	1.67	1.58	1.52	0.2
Manganese (mg/L)	3	0.07	0.199	0.15	0.14	0.1
<b>Dissolved Metals</b>						
Aluminum (mg/L)	3	< 0.015	0.153	0.146	0.102	0.1
Antimony (µg/L)	2	< 2	2	1	1	0
Arsenic (µg/L)	3	< 10	< 10	5	5	0
Cadmium (mg/L)	3	< 0.005	< 0.005	0.0025	0.0025	0.0
Chromium (mg/L)	3	< 0.004	< 0.004	0.002	0.002	0.0
Copper (mg/L)	3	< 0.005	1.67	0.0025	0.558	1.0
Iron (mg/L)	3	< 0.005	0.362	0.316	0.227	0.0
Lead (µg/L)	3	2	2	1	1	0
Manganese (mg/L)	3	0.008	0.199	0.121	0.109	0.1
Mercury (µg/L)	3	< 0.3	< 0.3	0.15	0.15	0.0
Nickel (mg/L)	3	< 0.006	< 0.006	0.003	0.003	0.0
Selenium (µg/L)	3	< 10	< 10	5	5	0
Silver (mg/L)	3	< 0.003	< 0.003	0.0015	0.0015	0.0
Thallium (µg/L)	3	< 0.006	< 0.006	0.5	0.334	0.3
Zinc (mg/L)	3	< 0.006	< 0.006	0.003	0.003	0.0
<b>Biological</b>						
Chlorophyll a (µg/L)	7	0.36	3.20	1.07	1.35	1.1
Fecal Coliform (col/100 mL)	7	67	> 2000	170	578	716

J=estimate; N=# samples; M=value > 25th percentile of all data collected within ecoregion 65p