

# 2005 Monitoring Summary



## Mulberry Creek at Alabama Hwy 22 (Chilton County) (32.80172/-86.82162)

### BACKGROUND

Alabama Department of Environmental Management's Environmental Indicators Section (EIS) selected the Mulberry 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.

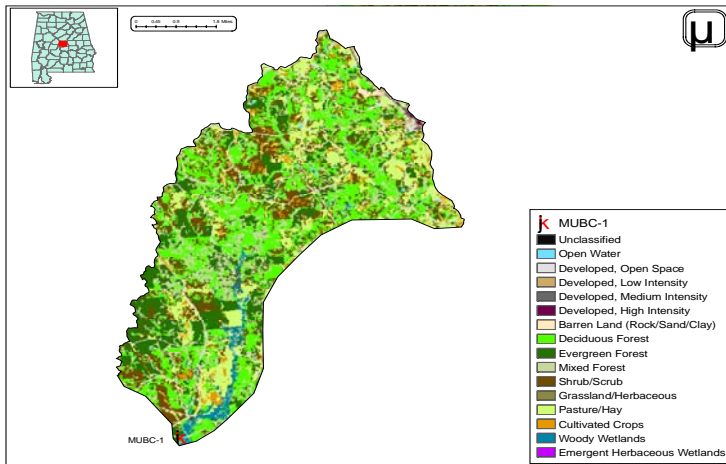


Figure 1. Sampling location and landuse within the Mulberry Creek watershed at MUBC-1.

### WATERSHED CHARACTERISTICS

Mulberry Creek is a *Fish & Wildlife (F&W)* stream located within the Alabama River basin (Fig. 1). It drains approximately 37 mi<sup>2</sup> in Chilton County and lies within the Fall Line Hills sub-ecoregion, which is characterized by oak hickory pine forested hilly terrain. Landuse within the watershed is primarily forest (57%), with some pasture/hay and crops. The area is well known for its peaches. The watershed contains eight permitted discharges. Watershed characteristics are summarized in 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. Mulberry Creek at MUBC-1 is a low-gradient, sand-bottomed stream. Overall habitat quality and availability within the reach were rated *marginal* due to lack of pool habitat and siltation. However, there was an abundance of woody debris that provided good 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 in *good* condition (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Drainage Area (mi <sup>2</sup> )		37
Ecoregion <sup>a</sup>		65i
% Landuse		
Open water		<1
Wetland	Woody	2
	Emergent herbaceous	<1
Forest	Deciduous	28
	Evergreen	16
	Mixed	13
Shrub/scrub		18
Grassland/herbaceous		<1
Pasture/hay		15
Cultivated crops		3
Development	Open space	4
	Low intensity	1
	Moderate intensity	<1
	High intensity	<1
Barren		<1
Population/km <sup>2b</sup>		30
# NPDES Permits <sup>c</sup>	<b>TOTAL</b>	8
	Construction Stormwater	5
	Mining General Permit (old)	2
	Industrial General	1

a. Fall Line Hills

b. 2000 US Census

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

Table 2. Physical characteristics at MUBC-1, June 16, 2005.

Physical Characteristics		
Width (ft)		39
Canopy cover		Mostly Shaded
Depth (ft)		
	Run	1.5
	Pool	2.5
% of Reach		
	Run	90
	Pool	10
% Substrate		
	Gravel	5
	Sand	75
	Silt	5
	Clay	2
	Organic Matter	13

**Table 3.** Results of the habitat assessment conducted at MUBC-1 June 16, 2005.

Habitat Assessment (% Maximum Score)		Rating
Instream habitat quality	37	Poor (<41)
Sediment deposition	58	Marginal (41-58)
Sinuosity	33	Poor (<45)
Bank and vegetative stability	46	Marginal (35-59)
Riparian buffer	85	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 at MUBC-1 June 16, 2005.

Macroinvertebrate Assessment			
	Results Scores		Rating
<b>Taxa richness measures</b>			
# EPT genera	19	76	Good (56-78)
<b>Taxonomic composition measures</b>			
% Non-insect taxa	11	70	Fair (61.8-92.7)
% Plecoptera	5	64	Excellent (>52.8)
% Dominant taxa	20	74	Good (70.5-85.2)
<b>Functional composition measures</b>			
% Predators	13	44	Fair (30.1-45.2)
<b>Tolerance measures</b>			
Beck's community tolerance index	11	50	Good (31.8-65.9)
% Nutrient tolerant organisms	36	57	Fair (50.8-76.2)
<b>WMB-I Assessment Score</b>	<b>---</b>	<b>62</b>	<b>Good (56-78)</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 >200 colonies/100 mL in five of seven samples collected. Five day biochemical oxygen demand, which is a measure of the amount of oxygen required by microorganisms to decompose organic matter in the water, and total suspended solids were greater than expected. Results of most metals analyses were below detection limits. Total and dissolved iron and manganese were detected at concentrations similar to 90 percent of samples collected at 65i ecoregional reference reaches.

## CONCLUSIONS

A habitat assessment and intensive water quality sampling suggested sedimentation and organic enrichment to be potential stressors to biological integrity of Mulberry Creek at MUBC-1. However, bioassessment results indicated the macroinvertebrate community to be in *good* condition.

**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)	10	14.0	25.0	22.0	21.0	3.6
Turbidity (NTU)	10	4.0	55.8	13.2	20.0	17.7
Total dissolved solids (mg/L)	7	14.0	97.0	43.0	50.9	28.5
Total suspended solids (mg/L)	7	9.0	83.0	25.0 <sup>M</sup>	39.1	30.7
Specific conductance (µmhos)	10	30.0	43.1	40.3	38.9	4.3
Hardness (mg/L)	6	7.6	14.0	11.3	11.2	2.2
Alkalinity (mg/L)	7	4.9	11.4	9.3	8.5	2.4
Stream Flow (cfs)	9	5.8	69.7	34.0	37.4	---
<b>Chemical</b>						
Dissolved oxygen (mg/L)	10	7.4	10	8.3	8.4	0.8
pH (su)	10	6.4	8.06	6.9	7.0	0.5
Ammonia Nitrogen (mg/L)	7	< 0.015	0.026	0.015	0.014	0.006
Nitrate+Nitrite Nitrogen (mg/L)	7	0.038	0.257	0.191	0.171	0.073
Total Kjeldahl Nitrogen (mg/L)	7	< 0.150	0.226	0.075	0.097	0.057
Total nitrogen (mg/L)	7	0.113	0.355	0.276	0.267	0.081
<sup>J</sup> Dissolved reactive phosphorus (mg/L)	7	< 0.004	0.051	0.009	0.019	0.018
Total phosphorus (mg/L)	7	0.017	0.077	0.049	0.046	0.020
CBOD-5 (mg/L)	7	1.3	2.6	2.2 <sup>M</sup>	2.0	0.5
TOC (mg/L)	1				2.887	
<sup>J</sup> Chlorides (mg/L)	6	4.5	5.62	4.9	5.0	0.4
Atrazine (µg/L)	2	< 0.05	< 0.05	0.03	0.03	0.00
<b>Total Metals</b>						
Aluminum (mg/L)	4	< 0.015	0.896	0.3255	0.389	0.378
Iron (mg/L)	4	1.38	3.19	1.995	2.140	0.784
Manganese (mg/L)	4	0.013	0.232	0.1495	0.136	0.091
<b>Dissolved Metals</b>						
Aluminum (mg/L)	4	< 0.015	< 0.015	0.0075	0.008	0.0
Antimony (µg/L)	4	< 2	< 2	1	1	0
Arsenic (µg/L)	4	< 10	< 10	5	5	0
Cadmium (mg/L)	4	< 0.005	< 0.005	0.0025	0.0025	0.0
Chromium (mg/L)	4	< 0.004	< 0.004	0.002	0.002	0.0
Copper (mg/L)	4	< 0.005	< 0.005	0.0025	0.174	0.344
Iron (mg/L)	4	0.032	0.248	0.127	0.1335	0.099
Lead (µg/L)	4	< 2	< 2	1	1	0
Manganese (mg/L)	4	< 0.005	0.044	0.039	0.029	0.023
<sup>J</sup> Mercury (µg/L)	4	< 0.3	< 0.3	0.15	0.1875	0.07
Nickel (mg/L)	4	< 0.006	< 0.006	0.003	0.003	0.0
Selenium (µg/L)	4	< 10	< 10	5	5	0
Silver (mg/L)	4	< 0.003	< 0.003	0.0015	0.0015	0.0
Thallium (µg/L)	4	< 1	< 1	0.5	0.500	0.000
Zinc (mg/L)	4	< 0.006	< 0.006	0.003	0.003	0.0
<b>Biological</b>						
<sup>J</sup> Chlorophyll <i>a</i> (µg/L)	7	0.36	17.62	1.07	4.26	6.37
<sup>J</sup> Fecal Coliform (col/100 mL)	7	40	1300	240	466	512

<sup>J</sup>=estimate; N=# samples; M=value > 90th percentile of samples collected at reference reaches within ecoregion 65i

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