

2005 Monitoring Summary



Calabee Creek at Macon County Road 40 (32.43341/-85.93381)

BACKGROUND

Calabee Creek from the Tallapoosa River to Macon County Road 9 has been on Alabama's Clean Water Act (CWA) §303(d) list of impaired waters for not meeting its *Fish and Wildlife (F&W)* water use classification due to siltation (habitat alteration) from agriculture and surface mining (ADEM 2007).

The Alabama Department of Environmental Management (ADEM) monitored Calabee Creek at CLBM-5 to verify and document impairment from siltation. The ADEM conducted macroinvertebrate and habitat assessments to evaluate impairment to aquatic communities. Monthly water chemistry samples were collected to identify the causes of impairment.

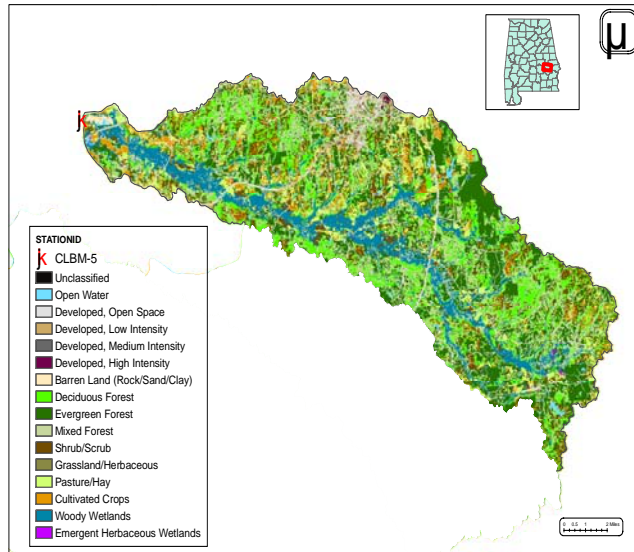


Figure 1. Sampling location and watershed of Calabee Creek at CLBM-5.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Calabee Creek at CLBM-5 is a large *F&W* stream located within the Southeastern Flood Plains and Low Terraces Ecoregion (65p). Landuse within the watershed is primarily forest (56%), shrub (13%), agriculture (13%), and woody wetland (12%). Ten mining permits have also been issued on the watershed.

REACH CHARACTERISTICS

General observations (Table 2) and a habitat assessment (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. Calabee Creek at CLBM-5 is a low gradient, mostly-open stream reach characterized by gravel and sand substrates. Overall habitat quality was characterized as *optimal*, despite some sedimentation and limited riffle habitat.

Table 1. Summary of watershed characteristics.

Watershed Characteristics	
Drainage Area (mi ²)	151
Ecoregion ^a	65p
% Landuse	
Open water	1
Wetland	Woody 12
Forest	Deciduous 18
	Evergreen 18
	Mixed 20
Shrub/scrub	13
Pasture/hay	8
Cultivated crops	5
Development	Open space 5
	Low intensity 1
Population/km ² ^b	23
# NPDES Permits ^c	TOTAL 19
	Construction Stormwater 14
	Mining 1
	Municipal Individual 4

- 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. Summary of physical characteristics at CLBM-5, June 22, 2005.

Physical Characteristics	
Width (ft)	50
Canopy cover	Mostly Open
Depth (ft)	
	Riffle 0.8
	Run 1.5
	Pool 3.0
% of Reach	
	Riffle 10
	Run 40
	Pool 50
% Substrate	
	Boulder 1
	Cobble 5
	Gravel 30
	Sand 32
	Silt 15
	Organic Matter 2

Table 3. Results of a habitat assessment conducted at CLBM-5, June 22, 2005.

Habitat Assessment (% Maximum Score)		Rating
Instream habitat quality	71	Optimal (>65)
Sediment deposition	59	Sub-optimal (53-65)
Sinuosity	70	Sub-optimal (65-84)
Bank and vegetative stability	69	Sub-optimal (60-74)
Riparian buffer	85	Sub-optimal (70-90)
Habitat assessment score	169	
% Maximum score	70	Optimal (>65)

Table 4. Results of the macroinvertebrate bioassessment conducted at CLBM-5, June 22, 2005.

Macroinvertebrate Assessment Results			
	Results	Scores	Rating
Taxa richness measures		(0-100)	
# Ephemeroptera (mayfly) genera	10	83	Good (71-85)
# Plecoptera (stonefly) genera	0	0	Very Poor (<16)
# Trichoptera (caddisfly) genera	8	67	Good (67-83)
Taxonomic composition measures			
% Non-insect taxa	12	54	Fair (49.4-74.1)
% Non-insect organisms	1	98	Excellent (>97)
% Plecoptera	0	0	Very Poor (<6.56)
Tolerance measures			
Beck's community tolerance index	4	14	Very Poor (<20.2)
WMB-I Assessment Score	---	45	Poor (24-48)

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 the score for each metric. Metric results indicated the macroinvertebrate community to be in *poor* condition (Table 4).

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. Fecal coliform counts were >2000 colonies/100ml during the July 14th sampling event, exceeding criteria for [F&W](#) use classification. Heavy rains on the previous day could possibly account for this elevated value. Median concentrations of total dissolved and suspended solids, hardness, alkalinity, nutrients, Chlorophyll *a*, chlorides and total metals were greater than expected based on the 25th percentile of all data collected in the 65p ecoregion.

CONCLUSIONS

Bioassessment results indicated the macroinvertebrate community to be in *poor* condition. Results of a habitat assessment and monthly water sampling support ADEM's 303 (d) listing of Calabee Creek for habitat degradation/siltation impairment. Results also suggest nutrient enrichment to be a potential issue at the site.

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.

Parameter	N	Min	Max	Median	Avg	SD
Physical						
Temperature (°C)	8	14.0	27.0	25.0	22.0	4.9
Turbidity (NTU)	8	9.0	47.0	20.9	24.9	12.6
Total Dissolved Solids (mg/L)	7	31.0	85.0	76.0 ^M	65.7	20.8
Total Suspended Solids (mg/L)	7	7.0	54.0	19.0 ^M	25.6	17.7
Specific Conductance (µmhos)	8	43.5	78.7	65.8	65.5	11.0
Hardness (mg/L)	6	18.3	22.4	21.5 ^M	20.8	1.7
Alkalinity (mg/L)	7	11.3	21.2	17.3 ^M	17.2	3.3
Stream Flow (cfs)	3	12.6	62.5	18.1	31.1	---
Chemical						
Dissolved Oxygen (mg/L)	8	7.0	10.1	7.5	7.9	1.1
pH (su)	7	6.9	8.2	7.3	7.4	0.5
Ammonia Nitrogen (mg/L)	7	< 0.015	0.046	0.008	0.018	0.016
Nitrate+Nitrite Nitrogen (mg/L)	7	0.053	0.296	0.144 ^M	0.177	0.100
Total Kjeldahl Nitrogen (mg/L)	7	< 0.150	1.053	0.630 ^M	0.558	0.339
Total Nitrogen (mg/L)	7	0.361	1.106	0.774 ^M	0.734	0.274
Dissolved Reactive Phosphorus (mg/L)	7	< 0.004	0.024	0.014 ^M	0.015	0.007
Total Phosphorus (mg/L)	7	0.033	0.161	0.072 ^M	0.077	0.042
CBOD-5 (mg/L)	7	1.3	4.4	1.7 ^M	2.1	1.1
Chlorides (mg/L)	7	4.8	7.8	5.9 ^M	5.9	1.0
Total Metals						
Aluminum (mg/L)	1	0.418	0.418	0.418 ^M	0.418	
Iron (mg/L)	1	1.99	1.99	1.99 ^M	1.990	
Manganese (mg/L)	1	0.076	0.076	0.076 ^M	0.076	
Dissolved Metals						
Aluminum (mg/L)	1	< 0.015	< 0.015	0.008	0.008	
Antimony (µg/L)	1	< 2	< 2	1	1	
Arsenic (µg/L)	1	< 10	< 10	5	5	
Cadmium (mg/L)	1	< 0.005	< 0.005	0.003	0.003	
Chromium (mg/L)	1	< 0.004	< 0.004	0.002	0.002	
Copper (mg/L)	1	< 0.005	< 0.005	0.003	0.003	
Iron (mg/L)	1	0.388	0.388	0.388	0.388	
Lead (µg/L)	1	< 2	< 2	1	1	
Manganese (mg/L)	1	0.067	0.067	0.067	0.067	
Mercury (µg/L)	1	< 0.3	< 0.3	0.3	0.3	
Nickel (mg/L)	1	< 0.006	< 0.006	0.003	0.003	
Selenium (µg/L)	1	< 10	< 10	5	5	
Silver (mg/L)	1	< 0.003	< 0.003	0.002	0.002	
Thallium (µg/L)	1	< 1	< 1	0.5	0.500	
Zinc (mg/L)	1	< 0.006	< 0.006	0.003	0.003	
Biological						
^J Chlorophyll <i>a</i> (µg/L)	7	1.07	7.48	3.20 ^M	3.30	2.1
^J Fecal Coliform (col/100 mL)	7	21	2100 ^C	73	362	767

N=# samples; E=estimate; M=median value > 25% of all data collected by ADEM in the 65p ecoregion. C= value exceeds established criteria for *F&W* water use classification.

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