

2005 Monitoring Summary



Cargle Creek at Chilton County Road 478 (32.82569/-86.50403)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Cargle 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.

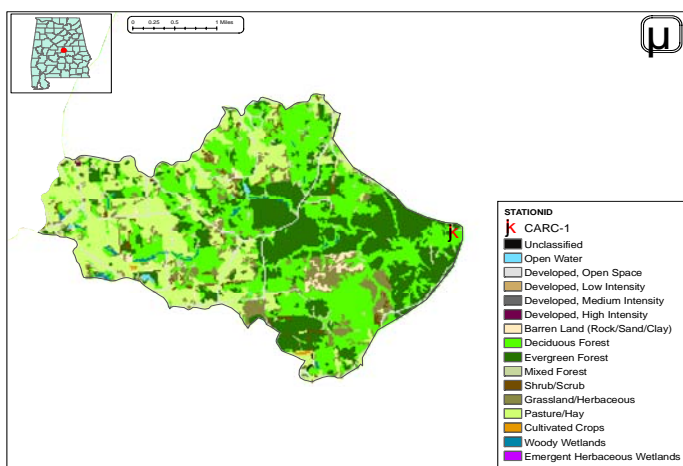


Figure 1. Sampling location and landuse within the Cargle Creek watershed at CARC-1.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Cargle Creek is a small *Fish & Wildlife (F&W)*, stream located near the city of Clanton (Fig. 1). This watershed falls within the Southern Inner Piedmont ecoregion, usually characterized by relatively low to moderate gradient streams with mostly cobble, gravel and sand substrates. Landuse within the watershed is primarily forest (61%) with some areas of pasture and hay. As of June 9, 2008, ADEM's NPDES Management System database did not show any permitted discharges located within 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. Cargle Creek at CARC-1 is a high-gradient, bedrock, cobble and boulder bottomed stream in the Coosa River basin. Overall habitat quality was categorized as *optimal* due to instream habitat quality and very little sediment deposition.

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 *excellent* condition (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics	
Drainage Area (mi ²)	10
Ecoregion ^a	45a
% Landuse	
Open water	<1
Wetland	Woody 1
Forest	Deciduous 35
	Evergreen 24
	Mixed 2
Shrub/scrub	1
Grassland/herbaceous	9
Pasture/hay	23
Cultivated crops	<1
Development	Open space 4
	Low intensity <1
	High intensity <1
Barren	1
Population/km ²	23

a. Southern Inner Piedmont

b. 2000 US census data

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

Physical Characteristics	
Width (ft)	30
Canopy cover	Mostly Shaded
Depth (ft)	
	Riffle 0.5
	Run 1.0
	Pool 3.0
% of Reach	
	Riffle 25
	Run 50
	Pool 25
% Substrate	
	Bedrock 30
	Boulder 20
	Cobble 30
	Gravel 12
	Sand 2
	Silt 3
	Organic Matter 3

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

Habitat Assessment (% Maximum Score)		Rating
Instream habitat quality	86	Optimal (> 70)
Sediment deposition	84	Optimal (> 70)
Sinuosity	85	Optimal (≥85)
Bank and vegetative stability	83	Optimal (≥75)
Riparian buffer	90	Sub-optimal (70-90)
Habitat assessment score	203	
% Maximum score	84	Optimal (> 70)

Table 4. Results of the macroinvertebrate bioassessment conducted June 16, 2005.

Macroinvertebrate Assessment			
	Results	Scores	Rating
Taxa richness measures		(0-100)	
# Ephemeroptera (mayfly) genera	12	100	Excellent (>85)
# Plecoptera (stonefly) genera	6	100	Excellent (>75)
# Trichoptera (caddisfly) genera	10	83	Excellent (>83)
Taxonomic composition measures			
% Non-insect taxa	3	86	Good (74.1-87.1)
% Non-insect organisms	0	99	Excellent (>97)
% Plecoptera	12	61	Excellent (>59.8)
Tolerance measures			
Beck's community tolerance index	32	100	Excellent (>80.4)
WMB-I Assessment Score	---	90	Excellent (>86)

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 a sample collected on Aug 23rd, after a high flow event. Median concentrations of total organic carbon and nitrate+nitrite-nitrogen were above concentrations expected in this ecoregion.

CONCLUSIONS

Bioassessment results indicated the macroinvertebrate community to be in *excellent* condition. However, nitrate+nitrite-nitrogen was a parameter of concern at this 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. 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)	9	14.0	25.0	21.0	20.3	4.0
Turbidity (NTU)	9	1.7	23.1	5.8	6.8	6.4
Total Dissolved Solids (mg/L)	7	9.0	122.0	31.0	45.4	41.2
Total Suspended Solids (mg/L)	7	4.0	9.0	8.0	7.1	2.1
Specific Conductance (µmhos)	9	33.1	57.1	37.5	40.2	8.4
Hardness (mg/L)	5	6.7	9.6	7.6	8.1	1.2
Alkalinity (mg/L)	7	2.4	7.5	5.2	5.4	1.8
Stream Flow (cfs)	8	2.7	48.8	11.8	18.4	---
Chemical						
Dissolved Oxygen (mg/L)	9	7.7	11	8.1	8.8	1.2
pH (su)	9	6.3	7.58	7.0	7.0	0.4
Ammonia Nitrogen (mg/L)	7	< 0.015	0.030	0.008	0.013	0.010
Nitrate+Nitrite Nitrogen (mg/L)	7	< 0.003	0.271	0.153 ^M	0.154	0.084
Total Kjeldahl Nitrogen (mg/L)	7	< 0.150	0.490	0.075	0.178	0.161
Total Nitrogen (mg/L)	7	0.076	0.608	0.286	0.331	0.174
Dissolved Reactive Phosphorus (mg/L)	7	0.005	0.012	0.009	0.009	0.002
Total Phosphorus (mg/L)	7	0.015	0.064	0.033	0.033	0.019
CBOD-5 (mg/L)	7	< 1.0	2.2	1.5	1.4	0.5
COD (mg/L)	2	< 2.0	< 2.0	1.0	1.0	0.0
TOC (mg/L)	1	2.4	2.4	2.4 ^M	2.4	---
^J Chlorides (mg/L)	6	4.4	6.4	4.8	5.1	0.7
Atrazine (µg/L)	1	< 0.05	< 0.05	0.03	0.03	---
Total Metals						
Aluminum (mg/L)	4	< 0.015	0.198	0.094	0.098	0.081
Iron (mg/L)	4	0.315	0.938	0.488	0.557	0.294
Manganese (mg/L)	4	< 0.005	0.082	0.011	0.026	0.037
Dissolved Metals						
Aluminum (mg/L)	4	< 0.015	< 0.015	0.008	0.008	0.000
Antimony (µg/L)	4	< 2	< 2	1	1	0.0
Arsenic (µg/L)	4	< 10	< 10	5	5	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	0.021	< 0.171	0.137	0.117	0.067
Lead (µg/L)	4	< 2	< 2	1	1	0.0
Manganese (mg/L)	4	< 0.005	< 0.005	0.003	0.003	0.000
Mercury (µg/L)	4	< 0.3	< 0.3	0.15	0.15	0.00
Nickel (mg/L)	4	< 0.006	< 0.006	0.003	0.003	0.000
Selenium (µg/L)	4	< 10	< 10	5	5	0.0
Silver (mg/L)	4	< 0.003	< 0.003	0.002	0.002	0.000
Thallium (µg/L)	4	< 1	< 1	0.5	0.500	0.000
Zinc (mg/L)	4	< 0.006	< 0.006	0.003	0.003	0.000
Biological						
^J Chlorophyll a (µg/L)	7	0.80	3.20	1.60	1.79	0.9
^J Fecal Coliform (col/100 mL)	7	6	> 3600 ^C	44	565	1339

^J=estimate; N=# samples; M=value > 90th percentile of all data collected within eco-region 45a; C=value exceeds established criteria for F&W streams.

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