

2005 Monitoring Summary



Gulf Creek at St. Clair County Road 295 near Steele, AL (33.91800/-86.25233)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Gulf 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 Assessment were to assess the biological integrity of each site and to estimate overall water quality within the ACT basin group.

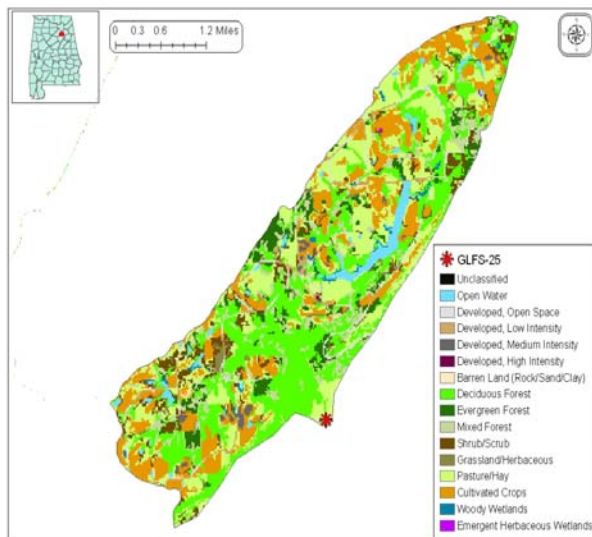


Figure 1. Sampling location and land use in Gulf Creek at GLFS-25.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Fig. 1 and Table 1. Gulf Creek is designated as a [Fish and Wildlife \(F&W\)](#) stream with a drainage area of approximately 11 square miles. It is part of the *Southern Limestone/Dolomite Valleys and Low Rolling Hills* subcoregion and Coosa River basin. The Gulf Creek watershed consists of forest (42%), pastures, and some cultivation. 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. Gulf Creek at GLFS-25 is a shallow, high-gradient site with cobble, boulder, gravel, and sand substrates. Habitat quality was rated as *marginal*.

Table 1. Summary of watershed characteristics.

Watershed Characteristics	
Drainage Area (mi ²)	11
Ecoregion ^a	67f
% Landuse	
Open water	3
Wetland	Woody 1 Emergent herbaceous <1
Forest	Deciduous 28 Evergreen 6 Mixed 8
Shrub/scrub	6
Grassland/herbaceous	1
Pasture/hay	24
Cultivated crops	18
Development	Open space 2 Low intensity 2 Moderate intensity 1 High intensity <1
Barren	<1
Population/km ² b	21

a. Southern Limestone/Dolomite Valleys and Low Rolling Hills
b. 2005 Census Data

Table 2. Physical characteristics of Gulf Creek at GLFS-25 May 20, 2005.

Physical Characteristics		
Width (ft)	15	
Canopy cover	Shaded	
Depth (ft)	Run	0.2
	Pool	0.3
% of Reach	Run	60
	Pool	40
% Substrate	Boulder	21
	Cobble	50
	Gravel	15
	Sand	10
	Silt	2
	Organic Matter	2

Table 3. Results of habitat assessment of Gulf Creek at GLFS-25, May 20, 2005.

Habitat Assessment	(% Maximum Score)	Rating
Instream habitat quality	60	Sub-optimal (53-65)
Sediment deposition	81	Optimal (>65)
Sinuosity	35	Poor (<45)
Bank and vegetative stability	38	Marginal (35-59)
Riparian buffer	50	Marginal (50-69)
Habitat assessment score	135	
% Maximum score	56	Marginal (53-65)

BIOASSESSMENT RESULTS

Benthic macroinvertebrate communities were sampled using ADEM's [Intensive Multi-habitat Bioassessment methodology \(WMB-I\)](#). The WMB-I measures taxonomic richness, community composition, and community tolerance to assess the overall health of the macroinvertebrate community. Each score is based on a 100 point scale with the final score comprising of the average of each metric score. The metric results indicated the macroinvertebrate community to be in *poor* condition (Table 4).

Table 4. Results of Macroinvertebrate Assessment of Gulf Creek at GLFS-25, May 20, 2005.

Macroinvertebrate Assessment Results			
	Results	Scores	Rating
Taxa richness measures		(0-100)	
# Ephemeroptera (mayfly) genera	3	25	Poor (23-46)
# Plecoptera (stonefly) genera	2	33	Fair (32-49)
# Trichoptera (caddisfly) genera	3	25	Poor (22-44)
Taxonomic composition measures			
% Non-insect taxa	11	56	Fair (49.4-74.1)
% Non-insect organisms	9	76	Fair (62.7-93.9)
% Plecoptera	0	0	Very Poor (<6.56)
Tolerance measures			
Beck's community tolerance index	8	29	Poor (20.2-40.7)
WMB-I Assessment Score	---	35	Poor (24-48)

WATER CHEMISTRY

Results for 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. Flow was very variable, ranging from 0.1 to 113 cfs during the six site visits. Median values were compared against the 90th percentile of data from least impaired reference reaches in ecoregion 67f. Results indicate that chlorophyll *a*, chlorides, and nitrate+nitrite nitrogen concentrations were higher than expected.

CONCLUSION

Bioassessment results indicated that macroinvertebrate community to be in *poor* condition. These biological conditions may be related to marginal habitat quality or scouring and other stressors associated with the flashy flow regime. Intensive water quality sampling also suggested nutrient enrichment as a potential cause of the degraded biological condition. The high chlorophyll *a* and chloride concentrations may be the result of an abnormally high flow during that particular sample. The presence of cultivated land near the stream may be the source of the elevated nutrient concentrations.

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)	7	10.0	26.0	21.0	19.7	6.2
Turbidity (NTU)	7	2.2	19.4	5.3	8.3	6.9
Total dissolved solids (mg/L)	6	19.0	156.0	36.0	54.8	50.7
Total suspended solids (mg/L)	6	4.0	14.0	5.0	6.7	3.7
Specific conductance (µmhos)	7	67.0	83.4	74.9	74.7	5.6
Hardness (mg/L)	4	23.7	29.1	26.4	26.4	2.4
Alkalinity (mg/L)	6	5.4	15.8	11.2	10.9	4.1
Stream flow (cfs)	6	0.1	112.8	14.3	32.1	---
Chemical						
Dissolved oxygen (mg/L)	7	7.9	10.4	8.5	9.0	1.1
pH (su)	7	6.9	8.3	7.5	7.6	0.6
Ammonia Nitrogen (mg/L)	6	0.015	0.040	0.008	0.014	0.013
Nitrate+nitrite nitrogen (mg/L)	6	0.251	0.473	0.353 ^M	0.355	0.094
Total Kjeldahl nitrogen (mg/L)	6	0.150	0.469	0.119	0.178	0.154
Total nitrogen (mg/L)	6	0.234	0.595	0.302	0.355	0.134
Dissolved reactive phosphorus (mg/L)	6	0.008	0.052	0.014	0.020	0.017
Total phosphorus (mg/L)	6	0.036	0.062	0.049	0.048	0.009
CBOD-5 (mg/L)	6	1.0	2.0	1.6	1.6	0.4
COD (mg/L)	1			<	2.0	
Chlorides (mg/L)	5	4.7	2.0	5.1 ^M	5.1	0.4
Atrazine (µg/L)	1			<	0.05	
Total Metals						
Aluminum (mg/L)	3	0.043	0.561	0.072	0.225	0.291
Iron (mg/L)	3	0.029	0.485	0.105	0.206	0.244
Manganese (mg/L)	3	0.007	0.061	0.03	0.033	0.027
Dissolved Metals						
Aluminum (mg/L)	3	< 0.015	< 0.015	0.008	0.008	0.000
Antimony (µg/L)	3	< 2	< 2	1	1	0
Arsenic (µg/L)	3	< 10	< 10	5	5	0
Cadmium (mg/L)	3	< 0.005	< 0.005	0.002	0.002	0.000
Chromium (mg/L)	3	< 0.004	< 0.004	0.002	0.002	0.000
Copper (mg/L)	3	< 0.005	< 0.005	0.002	0.002	0.000
Iron (mg/L)	3	< 0.005	0.040	0.003	0.015	0.022
Lead (µg/L)	3	< 2	< 2	1	1	0
Manganese (mg/L)	3	< 0.005	< 0.005	0.003	0.003	0.0
Mercury (µg/L)	3	< 0.3	< 0.3	0.2	0.2	0.1
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	0.002	0.002	0.000
Thallium (µg/L)	3	< 1	< 1	0.5	0.5	0.0
Zinc (mg/L)	3	< 0.006	< 0.006	0.003	0.003	0.000
Biological						
^J Chlorophyll <i>a</i> (mg/L)	5	1.60	4.63	3.20 ^M	3.17	1.07
^J Fecal Coliform (col/100 mL)	6	2	97	17	30	34

^J=estimate; N= # of samples; M=value >90% of collected samples in ecoregion 67f.

FOR MORE INFORMATION, CONTACT:
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