Goodwater Creek at Rigsby Road, Elmore County 32.44211/86.0086)

BACKGROUND

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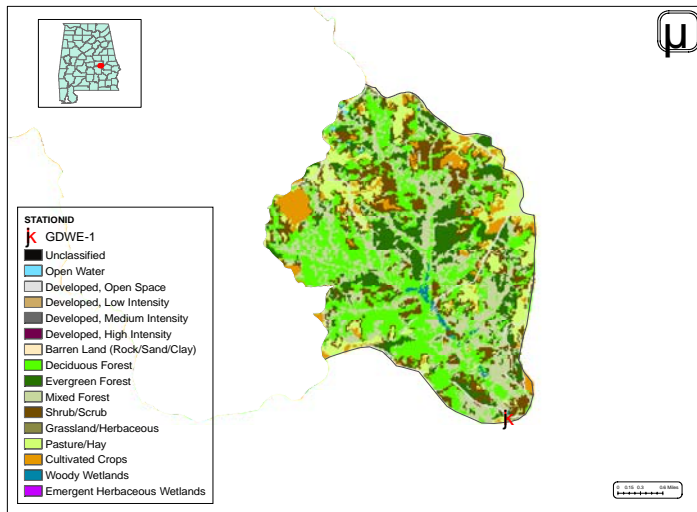

Figure 1. Sampling location and landuse within the Goodwater Creek watershed at GDWE-1.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Goodwater Creek is a small *Fish & Wildlife (F&W)* stream located in Elmore County (Fig. 1). Landuse within the watershed is primarily forest (64%), with some shrub and pasture areas.

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. Goodwater Creek at GDWE-1 is a high-gradient, riffle-run stream characterized by gravel, cobble and sand substrates in the Fall Line Hills ecoregion (65i). Overall habitat quality was categorized as *optimal* due to in-stream habitat and sinuosity.

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 *poor* condition (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Drainage Area (mi^2)		11
Ecoregion[a]		65i
% Landuse		
Wetland	Woody	1
Forest	Deciduous	27
	Evergreen	13
	Mixed	24
Shrub/scrub		15
Pasture/hay		11
Cultivated crops		6
Development	Open space	2
Population/km^2 [b]		22
# NPDES Permits[c]	**TOTAL**	1
Construction Stormwater		1

a. Fall Line Hills

b. 2000 Census Data

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

Table 2. Physical Characteristics at GDWE-1, May 11, 2005.

Physical Characteristics		
Width (ft)		15
Canopy cover		Est. 50/50
Depth (ft)		
	Riffle	0.8
	Run	1.5
	Pool	2.5
% of Reach		
	Riffle	30
	Run	50
	Pool	20
% Substrate		
	Boulder	1
	Cobble	15
	Gravel	59
	Sand	20
	Organic Matter	5

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Table 3. Results of the habitat assessment conducted May 11, 2005.

Habitat Assessment (% Maximum Score)		Rating
Instream habitat quality	80	Optimal (>65)
Sediment deposition	53	Marginal (40-52)
Sinuosity	88	Optimal (≥85)
Bank and vegetative stability	55	Marginal (35-59)
Riparian buffer	81	Sub-optimal (70-90)
Habitat assessment score	171	
% Maximum score	**71**	**Optimal (>65)**

Table 4. Results of the macroinvertebrate bioassessment conducted May 11, 2005.

Macroinvertebrate Assessment Results			
	Results	Scores (0-100)	Rating
Taxa richness measures			
# Ephemeroptera (mayfly) genera	2	17	Very Poor (<23)
# Plecoptera (stonefly) genera	2	33	Fair (32-49)
# Trichoptera (caddisfly) genera	1	8	Very Poor (<22)
Taxonomic composition measures			
% Non-insect taxa	0	100	Excellent (>87.1)
% Non-insect organisms	0	100	Excellent (>97)
% Plecoptera	9	44	Good (19.7-59.8)
Tolerance measures			
Beck's community tolerance index	4	14	Very Poor (<20.2)
WMB-I Assessment Score	**---**	**45**	**Poor (24-48)**

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. Results of water chemistry analyses are presented in Table 5. Median concentrations of all parameters were within the range expected in the Fall Line Hills ecoregion.

CONCLUSIONS

Bioassessment results indicated the macroinvertebrate community to be in *poor* condition. Overall habitat quality was categorized as *optimal* due to stable in-stream habitat and sinuosity.

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)	8		11.7		26.0	22.5	20.6	4.7
Turbidity (NTU)	7		4.1		58.8	9.1	14.6	19.6
Total Dissolved Solids (mg/L)	7		31.0		113.0	37.0	47.6	29.2
Total Suspended Solids (mg/L)	7		6.0		56.0	11.0	18.4	18.3
Specific Conductance (μmhos)	8		18.0		26.5	22.7	22.7	2.7
Hardness (mg/L)	5		2.8		6.9	5.7	5.2	1.6
Alkalinity (mg/L)	7		1.7		5.1	2.9	3.1	1.2
Stream Flow (cfs)	6		2.3		45.5	11.8	16.0	15.0
Chemical								
Dissolved Oxygen (mg/L)	8		8.2		10.7	8.7	9.0	0.8
pH (su)	7		6.5		8.24	6.7	7.1	0.8
Ammonia Nitrogen (mg/L)	7	<	0.015	<	0.015	0.008	0.008	0.000
Nitrate+Nitrite Nitrogen (mg/L)	7	<	0.003		0.118	0.100	0.083	0.041
Total Kjeldahl Nitrogen (mg/L)	7	<	0.150		0.575	0.177	0.239	0.192
Total Nitrogen (mg/L)	7		0.133		0.693	0.188	0.322	0.208
Dissolved Reactive Phosphorus (mg/L)	7	<	0.004		0.011	0.006	0.006	0.004
Total Phosphorus (mg/L)	7	<	0.004		0.044	0.019	0.020	0.017
CBOD-5 (mg/L)	7		1.4		2.9	1.8	1.9	0.5
Chlorides (mg/L)	7		4.2		6.9	4.7	5.3	1.1
Atrazine (μg/L)	2	<	0.05		0.06	0.04	0.04	0.0
Total Metals								
Aluminum (mg/L)	4		0.032		0.132	0.076	0.079	0.044
Iron (mg/L)	4		0.76		1.33	1.115	1.080	0.239
Manganese (mg/L)	4		0.038		0.113	0.057	0.066	0.033
Dissolved Metals								
Aluminum (mg/L)	4	<	0.015		0.14	0.008	0.041	0.066
Antimony (μg/L)	4	<	2	<	2	1	1	0
Cadmium (mg/L)	4	<	0.005	<	0.005	0.002	0.002	0.000
Chromium (mg/L)	4	<	0.004		0.005	0.002	0.002	<0.001
Copper (mg/L)	4	<	0.004		0.005	0.003	0.002	<0.001
Iron (mg/L)	4	<	0.005		0.176	0.101	0.095	0.082
Lead (μg/L)	4	<	2	<	2	1	1	0
Manganese (mg/L)	4	<	0.011		0.077	0.036	0.040	0.028
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
Silver (mg/L)	4	<	0.003	<	0.003	0.002	0.002	0.000
Thallium (μg/L)	4	<	1	<	1	0.5	0.5	0.0
Zinc (mg/L)	4	<	0.006	<	0.006	0.003	0.003	0.000
Biological								
[J] Chlorophyll a (μg/L)	7		0.53		23.5	1.60	6.41	8.65
[J] Fecal Coliform (col/100 mL)	7		8		420	31	144	169

J=estimate; N=# samples; M=value > 90% of all verified ecological reference reach data collected within eco-region 65i