

2005 Monitoring Summary



Cedar Creek at Alabama State Road 21 in Wilcox County (31.99548/ -86.89733)

BACKGROUND

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

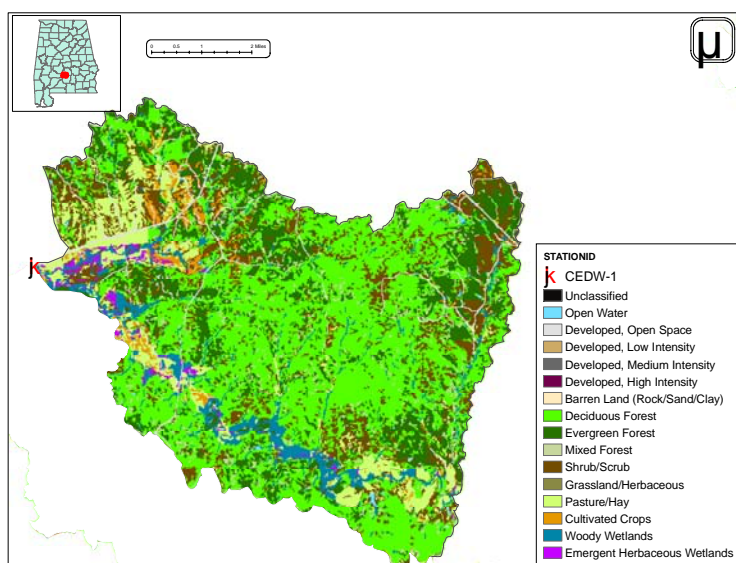


Figure 1. Sampling location and landuse within the Cedar Creek watershed at CEDW-1.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Cedar Creek is a large Fish & Wildlife (F&W) stream located in the Alabama River basin, in northeast Wilcox County. This watershed falls within the Southern Hilly Gulf Coastal Plains ecoregion (65d), usually characterized by relatively low gradient, sandy bottom streams (Griffith *et al.* 2001)(Table 1). Landuse within the watershed is primarily forest (65%), with some agricultural (10%) and wetland areas (7%).

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. Cedar Creek at CEDW-1 is a low-gradient, sand-bottomed stream, typical of streams in this ecoregion (65d). Overall habitat quality was categorized as *marginal* due to poor sinuosity, marginal bank stability, and a lack of stable in-stream habitat. Active pasture grazing was observed near the sampling location.

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 dominated by few taxa groups which include only a few predator species, indicating a *fair* community condition (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics	
Drainage Area (mi ²)	53
Ecoregion ^a	65d
% Landuse	
Open water	<1
Wetland	Woody 6
	Emergent herbaceous 1
Forest	Deciduous 45
	Evergreen 17
	Mixed 3
Shrub/scrub	15
Grassland/herbaceous	<1
Pasture/hay	8
Cultivated crops	2
Development	Open space 2
	Low intensity <1
Population/km ^{2b}	4
# NPDES Permits ^c	TOTAL 9
	Construction Stormwater 3
	Mining General Permit (old) 6

a.Southern Hilly Gulf Coastal Plains

b.2000 US Census

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

Table 2. Physical characteristics at CEDW-1, May 27, 2005.

Physical characteristics	
Width (ft)	50
Canopy cover	Open
Depth (ft)	
	Run 0.7
	Pool 5.0
% of Reach	
	Run 95
	Pool 5
% Substrate	
	Sand 86
	Silt 10
	Organic Matter 4

Table 3. Results of the habitat assessment conducted May 27, 2005.

Habitat Assessment (% Maximum Score)		Rating
Instream habitat quality	41	Marginal (40-52)
Sediment deposition	59	Sub-optimal (53-65)
Sinuosity	40	Poor (<45)
Bank and vegetative stability	44	Marginal (35-59)
Riparian buffer	83	Sub-optimal (70-90)
Habitat assessment score	115	
% Maximum score	52	Marginal (40-52)

Table 4. Results of the macroinvertebrate bioassessment conducted June 24, 2005.

Macroinvertebrate Assessment			
	Results	Scores	Rating
Taxa richness measures			
# EPT genera	13	52	Fair (37-56)
Taxonomic composition measures			
% Non-insect taxa	5	99	Excellent (>96.34)
% Plecoptera	3	5	Fair (3.7-5.6)
% Dominant taxa	37	32	Poor (23.5-47.0)
Functional composition measures			
% Predators	8	3	Very Poor (<15.1)
Tolerance measures			
Beck's community tolerance index	5	23	Fair (21.2-31.8)
% Nutrient tolerant organisms	17	89	Excellent (>88.1)
WMB-I Assessment Score	---	43	Fair (37-56)

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 one of 6 samples collected (April 13th). However, the sample was collected during a high flow event. Median concentrations of total dissolved solids, hardness, alkalinity, dissolved reactive phosphorus, and total phosphorus were above concentrations expected in this ecoregion.

CONCLUSIONS

Bioassessment results indicated the macroinvertebrate community to be in *fair* condition. Overall habitat quality was categorized as *marginal* due to poor sinuosity, bank instability, and a lack of available stable in-stream habitat. Median concentrations of total dissolved solids, hardness, alkalinity, dissolved reactive phosphorus, and total phosphorus were above values expected in this ecoregion. This site could be considered as a potential best management practice site (BMP) to help alleviate the effects of nearby grazing.

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)	7	9.0	31.0	23.4	22.3	7.2
Turbidity (NTU)	8	4.9	128.0	18.0	39.4	47.0
Total Dissolved Solids (mg/L)	7	151.0	237.0	204.0 ^M	196.0	32.6
Total Suspended Solids (mg/L)	7	5.0	266.0	28.0	72.7	93.8
Specific Conductance (µmhos)	7	267.5	377.1	273.6	305.6	45.5
Hardness (mg/L)	3	139.0	190.0	170.0 ^M	166.3	25.7
Alkalinity (mg/L)	7	126.1	177.4	142.7 ^M	149.2	21.4
Stream Flow (cfs)	7	14.3	174.3	46.5	70.7	---
Chemical						
Dissolved Oxygen (mg/L)	7	6.8	13.3	8.2	8.9	2.2
pH (su)	7	7.4	8.2	7.9	7.8	0.3
Ammonia Nitrogen (mg/L)	7	< 0.015	0.154	0.008	0.028	0.055
Nitrate+Nitrite Nitrogen (mg/L)	7	< 0.003	0.021	0.003	0.008	0.009
Total Kjeldahl Nitrogen (mg/L)	7	0.158	0.752	0.249	0.372	0.219
Total Nitrogen (mg/L)	7	0.179	0.753	0.263	0.379	0.215
Dissolved Reactive Phosphorus (mg/L)	7	0.009	0.044	0.025 ^M	0.026	0.012
Total Phosphorus (mg/L)	7	< 0.004	0.147	0.102 ^M	0.090	0.048
CBOD-5 (mg/L)	7	< 1.0	2.5	1.3	1.3	0.9
^J Chlorides (mg/L)	7	4.2	6.8	5.6	5.6	0.9
Atrazine (µg/L)	2	0.05	0.05	0.03	0.03	---
Total Metals						
Aluminum (mg/L)	4	< 0.015	0.589	0.227	0.262	0.285
Iron (mg/L)	4	0.315	1.55	0.73	0.831	0.557
Manganese (mg/L)	4	< 0.005	0.038	0.023	0.021	0.016
Dissolved Metals						
Aluminum (mg/L)	4	< 0.015	0.087	0.008	0.027	0.040
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	< 0.005	0.015	0.0025	0.006	0.006
Lead (µg/L)	4	< 2	< 2	1	1	0.0
Manganese (mg/L)	4	< 0.005	0.016	0.003	0.006	0.007
Mercury (µg/L)	4	< 0.3	< 0.3	0.15	0.15	0.000
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	0.5	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	4.27	2.67	2.44	1.48
^J Fecal Coliform (col/100 mL)	6	60	> 2000	380	725	796

J=estimate; N=# samples; M=Value > 90th percentile of verified ecoregional reference reach samples within eco-region 65d