

2011 Monitoring Summary



Coal Fire Creek on Water Mill Road in Pickens County (33.49180/-88.01386)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Coal Fire Creek watershed for biological and water quality monitoring as part of the 2011 Escatawpa, Mobile, and Tombigbee (EMT) River Basin Assessments. The objectives of the project were to assess the biological integrity of each monitoring site and to estimate overall water quality within these basins.



Figure 1. Coal Fire Creek at CLFP-13.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Coal Fire Creek is a *Swimming/Fish & Wildlife (F&W)* stream located in the Fall Line Hills subecoregion (65i). Based on the 2006 National Land Cover Dataset, landuse within the watershed is predominantly forest (74%). As of June 6, 2013 three construction stormwater, two industrial individual, and three municipal individual permits have been issued within this 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. Coal Fire Creek at CLFP-13 is a low-gradient, glide-pool stream in the Fall Line Hills sub-ecoregion, with substrate composed primarily of sand and clay (Figure 1). The high percentage of clay substrate is unusual for streams in this sub-ecoregion, which are generally characterized by small gravel riffles and sand substrates. The reach was characterized by limited instream habitat and a relatively straight stream channel. Water quality samples were collected from the bridge, where the stream was non-wadeable and velocity was slow. However, upstream where the bioassessment was conducted, the CLFP-13 became narrow and shallow. Tables 2 and 3 reflect conditions where the bioassessment was conducted.

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 all individual metric scores. Metric results indicated the macroinvertebrate community to be in *poor* condition (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin	Upper Tombigbee	
Drainage Area (mi²)	31	
Ecoregion^a	65i	
% Landuse		
Open water		<1
Wetland	Woody	3
	Emergent herbaceous	<1
Forest	Deciduous	46
	Evergreen	9
	Mixed	19
Shrub/scrub		12
Grassland/herbaceous		1
Pasture/hay		3
Cultivated crops		2
Development	Open space	4
	Low intensity	<1
Population/km^{2b}	4	
# NPDES Permits^c	TOTAL	8
	Construction Stormwater	3
	Industrial Individual	2
	Municipal Individual	3

a.Fall Line Hills

b.2000 US Census

c.#NPDES permits downloaded from ADEM's NPDES Management System database, June 6, 2013.

Table 2. Physical characteristics of Coal Fire Creek at CLFP-13, May 31, 2011.

Physical Characteristics		
Canopy Cover	Mostly Shaded	
Width (ft)	3	
Depth (ft)		
	Run	0.2
	Pool	0.8
% of Reach		
	Run	98
	Pool	2
% Substrate		
	Clay	30
	Gravel	5
	Sand	47
	Silt	15
	Organic Matter	3

Table 3. Results of the habitat assessment conducted on Coal Fire Creek at CLFP-13, May 31, 2011.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	24	Poor <40
Sediment Deposition	69	Optimal >65
Sinuosity	43	Poor <45
Bank and Vegetative Stability	60	Sub-optimal (60-74)
Riparian Buffer	90	Optimal >89
Habitat Assessment Score	124	
% Maximum Score	56	Sub-optimal (53-65)

Table 4. Results of the macroinvertebrate bioassessment conducted in Coal Fire Creek at CLFP-13, May 31, 2011.

Macroinvertebrate Assessment		
	Results	Scores
(0-100)		
Taxa richness and diversity measures		
% EPC taxa	13	0
% Dominant Taxon	27	55
Taxonomic composition measures		
% EPT minus Baetidae and Hydropsychidae	0	0
Functional feeding group		
# Collector Taxa	15	40
Community tolerance		
% Nutrient Tolerant individuals	34	55
WMB-I Assessment Score	---	30
WMB-I Assessment Rating		Poor (16-31)

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. In situ measurements and water samples were collected March, May, July, and September of 2011 to help identify any stressors to the biological communities. Organics were not collected. Due to non-wadeable conditions, the stream flow was only measured once on May 31st. Stream pH exceeded *F&W* use criteria four out of the five months it was sampled. Median specific conductance values were higher than background levels for the Fall Line Hills ecoregion. This may be due to the high percentage of clay substrate. Water samples were collected from the bridge, where the stream was non-wadeable and velocity was slow, and may have affected the water quality results.

SUMMARY

Overall habitat quality in Coal Fire Creek at CLFP-13 was categorized as *sub-optimal* due to poor instream habitat quality and stream sinuosity. The reach was also characterized by a high percentage of clay substrates, which is atypical of streams in ecoregion 65i. Bioassessment results indicated the macroinvertebrate community to be in *poor* condition. Monitoring should continue at CLFP-13 to ensure that biological and water quality conditions remain stable.

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Table 5. Summary of water quality data collected March-September, 2011. Minimum (Min) and maximum (Max) values calculated using minimum detection limits (MDL). 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	Med	Avg	SD	E
Physical							
Temperature (°C)	5	16.3	27.0	20.3	21.2	4.3	
Turbidity (NTU)	5	10.9	32.9	17.3	19.3	9.2	
Total Dissolved Solids (mg/L)	4	36.0	70.0	49.0	51.0	14.1	
Total Suspended Solids (mg/L)	4	< 1.0	6.0	1.5	2.4	2.5	
Specific Conductance (µmhos)	5	23.0	31.9	27.0 ^G	27.0	3.4	
Hardness (mg/L)	4	4.3	6.9	5.0	5.3	1.2	
Alkalinity (mg/L)	4	2.7	4.7	3.3	3.5	0.8	
Stream Flow (cfs)	1				0.3		
Chemical							
Dissolved Oxygen (mg/L)	5	5.6	9.0	7.6	7.4	1.3	
pH (su)	5	5.2 ^C	6.0	5.5	5.6	0.3	4
Ammonia Nitrogen (mg/L)	4	< 0.005	< 0.005	0.002	0.002	0.000	
^J Nitrate+Nitrite Nitrogen (mg/L)	4	0.079	0.402	0.162	0.201	0.143	
Total Kjeldahl Nitrogen (mg/L)	4	0.209	0.804	0.446	0.476	0.247	
^J Total Nitrogen (mg/L)	4	0.408	0.883	0.710	0.678	0.215	
^J Dissolved Reactive Phosphorus (mg/L)	4	0.005	0.008	0.006	0.006	0.001	
Total Phosphorus (mg/L)	4	0.016	0.021	0.020	0.019	0.002	
CBOD-5 (mg/L)	4	< 2.0	< 2.0	1.0	1.0	0.0	
Chlorides (mg/L)	4	1.7	2.5	2.0	2.1	0.4	
Total Metals							
Aluminum (mg/L)	4	0.232	0.409	0.287	0.304	0.080	
Iron (mg/L)	4	1.510	2.360	1.810	1.872	0.387	
Manganese (mg/L)	4	0.178	0.291	0.186	0.210	0.054	
Dissolved Metals							
Aluminum (mg/L)	4	< 0.043	< 0.043	0.022	0.022	0.000	
Antimony (µg/L)	4	< 1.9	< 1.9	0.9	0.9	0.0	
Arsenic (µg/L)	4	< 1.4	< 1.4	0.7	0.7	0.0	
^J Cadmium (mg/L)	4	< 0.000	< 0.000	0.000	0.000	0.000	
Chromium (mg/L)	4	< 0.009	< 0.009	0.004	0.004	0.000	
Copper (mg/L)	4	< 0.020	< 0.020	0.010	0.010	0.000	
^J Iron (mg/L)	4	0.190	0.348	0.231	0.250	0.069	
Lead (µg/L)	4	< 0.9	< 0.9	0.5	0.5	0.0	
Manganese (mg/L)	4	0.157	0.267	0.163	0.188	0.053	
Mercury (µg/L)	4	< 0.0	< 0.0	0.0	0.0	0.0	
Nickel (mg/L)	4	< 0.042	< 0.042	0.021	0.021	0.000	
^J Selenium (µg/L)	4	< 1.3	3.0	0.7	1.2	1.2	
Silver (mg/L)	4	< 0.000	< 0.000	0.000	0.000	0.000	
Thallium (µg/L)	4	< 1.1	< 1.1	0.5	0.5	0.0	
Zinc (mg/L)	4	< 0.012	< 0.012	0.006	0.006	0.000	
Biological							
Chlorophyll a (µg/L)	4	< 0.10	2.14	1.07	1.08	0.85	
^J E. coli (col/100mL)	4	102	222	151	156	53	

C=*F&W* use class criterion exceeded; E=# samples that exceeded criteria; G=value higher than median concentration of all verified ecoregional reference reach data collected in the ecoregion 65i; J=estimate; N=# samples.