

2019 Monitoring Summary



Flat Creek at Lawrence County Road 87 (34.49610/-87.131896)

BACKGROUND

The Alabama Department of Environmental Management selected Flat Creek for biological and water quality monitoring in order to fulfill the requirements of §319(b) of the Clean Water Act. This section mandates that all states develop and implement non-point source monitoring programs using shared information and experience with the goal of reducing the amount of surface run-off and other man-made sources of pollution.

Flat Creek, from the West Flint Creek to its source (approximately 8 miles), was placed on the Clean Water Act 2022 §303(d) list of impaired waters due to pathogens (*E. coli*) from habitat alteration and pasture grazing. It was monitored in 2019 to document water quality conditions before implementation of the Flat Creek Watershed Management Plans (WMP's). The WMP was designed to improve water quality of Flat Creek and potentially remove it from the §303(d) list.



Figure 1. Photo of Flat Creek at FLTL-1, June 19, 2019.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Flat Creek is a very small *Fish & Wildlife (F&W)* stream near Moulton. Based on the 2011 National Land Cover Dataset, landuse within the watershed is forest (23%) and pasture (50%). As of February 23, 2011, the Alabama Department of Environmental Management has not issued any NPDES permits in this watershed.

REACH CHARACTERISTICS

General observations (Table 2) and a habitat survey (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. Flat Creek at FLTL-1 is a very shallow, bedrock, boulder, cobble, gravel bottomed, high-gradient stream in the Little Mountain ecoregion (Figure 1). Overall habitat quality was rated as *sub-optimal* due to marginal riparian zone measurements and low riffle frequency.

BIOASSESSMENT RESULTS

The benthic macroinvertebrate community was sampled using ADEM's Intensive Multi-habitat Bioassessment methodology (WMB-I). Measures of taxonomic richness, community composition and pollution tolerance were used to assess the overall health of the macroinvertebrate community in comparison to conditions expected in north Alabama streams and rivers. Each site is placed in one of six levels ranging from 1, or natural, to 6, or highly altered.

Results of the macroinvertebrate survey indicated the community to be in *poor-fair* condition. Seventy-six taxa were collected, including nine EPT taxa. Sixteen sensitive taxa were collected, but highly sensitive taxa were completely absent from the collection. No Plecoptera were collected. Fifty percent of collected organisms were filtering-collectors. Forty-seven percent of collected organisms were classified as nutrient tolerant (Table 4).

Table 1. Summary of general watershed characteristics: FLTL-1.

Watershed Characteristics	
Basin	Tennessee
Drainage Area (mi²)	9.2
Ecoregion^o	71j
Assessment Unit	AL06030002-1013-900
Use Class	F&W
AU Category	4a
12-digit Hydrologic Unit Code (HUC)	060300021013
Landuse Categories (2011 National Land Cover Dataset)	
Open Water (%)	0.9
Wetland, Total (%)	2.7
Wetlands, Woody (%)	2.7
Forested, Total (%)	22.6
Forested, Deciduous (%)	18.0
Forested, Evergreen (%)	1.8
Forested, Mixed (%)	2.8
Shrub/Scrub (%)	6.5
Grassland/Herbaceous (%)	1.8
Pasture/Hay (%)	49.9
Crops, Cultivated (%)	2.6
Developed, Total (%)	12.7
Developed, Open Space (%)	7.6
Developed, Low Intensity (%)	4.1
Developed, Medium Intensity (%)	0.9
Developed, High Intensity (%)	0.1
Barren Land (Rock, Sand, Clay) (%)	0.2
Population/km (2010 US Census)	85
Roads	
Road Density	2.6
# Road Crossings per Stream km	1.3
Watershed Disturbance Score*	386
Watershed Disturbance Category*	6

^o Little Mountain

* Measure of watershed disturbance based on landuse, population, and road density summarized in this table.

Table 2. Physical characteristics of Flat Creek at FLTL-1, June 19, 2019.

Physical Characteristics	
Width (ft)	15
Canopy Cover	Shaded
Depth (ft)	
Riffle	0.3
Run	1.0
Pool	1.5
% of Reach	
Riffle	5
Run	85
Pool	10
% Substrate	
Bedrock	40
Boulder	10
Cobble	25
Gravel	10
Sand	6
Silt	5
Organic Matter	4

Table 3. Results of the habitat assessment survey conducted on Flat Creek at FLTL-1, June 19, 2019.

Habitat Survey	% Max Score	Rating
Instream Habitat Quality	58	Sub-optimal (55-74.999)
Sediment Deposition	71	Sub-optimal (55-74.999)
Riffle Frequency	55	Sub-optimal (55-74.999)
Bank Vegetative Stability	59	Sub-optimal (55-74.999)
Riparian Zone Measurements	54	Marginal/Sub-optimal (50-54.999)
Habitat Assessment Score	120	
% Maximum Score	60	Sub-optimal (55-69.999)

Table 4. Results of the macroinvertebrate survey conducted on Flat Creek at FLTL-1, June 19, 2019.

Macroinvertebrate Assessment	Results	Scores
Taxonomic richness and diversity metrics		
Taxa Count	76	76
# rare and highly sensitive taxa	0	0
# sensitive taxa	16	16
# sensitive EPT taxa	2	2
Percent taxon metrics		
% rare and highly sensitive taxa	0	0
% sensitive taxa	21	21
% sensitive EPT taxa	3	3
% highly tolerant taxa	13	13
Percent individual metrics		
% rare and highly sensitive individuals	0	0
% sensitive individuals	8	8
% sensitive EPT individuals	7	7
% tolerant individuals	29	29
WMB-I Survey Score		4.5
WMB-I Survey Rating		Poor-fair (4.5-4.849)

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. When possible, in situ measurements and water samples are collected monthly, semi-monthly (metals), or quarterly (pesticides, atrazine, and semi-volatile organics) from March through October 2019 to help identify any stressors to the biological communities. Dissolved oxygen values were below the minimum value allowed by the F&W water use classification during four of the eight sampling events. Stream pH concentrations were less than values for a typical Little Mountain ecoregion stream during four sampling events. E. coli exceeded the F&W single sample criterion during the May and June sampling events.

Table 5. Summary of water quality data collected March-October, 2019. Minimum (Min) and maximum (Max) values calculated using minimum detection limits (MDL) when results were less than this value for non-metals parameters. Median, average (Avg), and standard deviations (SD) values were calculated by multiplying the MDL by 0.5 when results were less than this value.

FLTL-1 AL06030002-1013-900	N	Min	Max	Med	Avg	SD	E	10thP	90thP
Physical									
Temperature (°C)	9	7.5	25.4	21.8	19.1	6.0	7.5	25.4	
Turbidity (NTU)	9	3.3	10.3	5.5	6.1	2.0	3.3	10.3	
Total Dissolved Solids (mg/L)	8	40.0	90.0	78.0	73.4	15.4	40.0	90.0	
Total Suspended Solids (mg/L)	8	<1.0	11.0	6.0	6.0	4.5	0.5	11.0	
Specific Conductance (µmhos/cm)	9	69.5	141.5	127.0	121.5	23.6	69.5	141.5	
Alkalinity (mg/L)	8	24.8	64.6	52.1	50.6	13.4	24.8	64.6	
Measured Stream Flow (cfs)	5	0.7	30.2	2.8	7.7	12.7	0.7	30.2	
Chemical									
Dissolved Oxygen (mg/L)	9	1.00 ^C	12.4	5.1	5.7	4.0	4	1.0	12.4
pH (SU)	9	6.8 ^D	7.5	7.1	7.1	0.2	3	6.8	7.5
Ammonia Nitrogen (mg/L)	8	<0.004	0.039	0.008	0.015	0.015	0.002	0.039	
Nitrate+Nitrite Nitrogen (mg/L)	8	<0.003	0.432	0.124	0.156	0.154	0.002	0.432	
Total Kjeldahl Nitrogen (mg/L)	8	<0.200	0.683	0.386	0.376	0.225	0.100	0.683	
Total Nitrogen (mg/L)	8	<0.174	0.790	0.578	0.532	0.200	0.174	0.790	
Dis Reactive Phosphorus (mg/L)	8	<0.005	0.027	0.007	0.009	0.008	0.002	0.027	
Total Phosphorus (mg/L)	8	<0.010	0.104	0.028	0.044	0.036	0.010	0.104	
CBOD-5 (mg/L)	8	<2.0	<2.0	1.0	1.0	0.0	1.0	1.0	
Chlorides (mg/L)	8	2.6	4.0	3.6	3.4	0.5	2.6	4.0	
Sulfate (mg/L)	8	1.21	4.45	3.35	3.04	1.32	1.21	4.45	
Biological									
Chlorophyll a (mg/m³)	8	<1.00	17.10	1.60	3.46	5.59	0.50	17.10	
E. coli (MPN/DL)	8	52.8	410.6 ^H	125.6	177.8	146.4	2	52.8	410.6

C= F&W criterion violated; D=an individual value >90% of all verified ecoregional reference reach data collected in the ecoregion 71j; E=# samples that exceeded criteria; H= F&W human health criterion exceeded; J=estimate; N=# samples.

SUMMARY

Bioassessment results indicated the macroinvertebrate community at FLTL-1 to be in *poor-fair* condition. A lack of riparian buffer, low pH and dissolved oxygen measurements may be potential causes of the biological deterioration within this community. E. coli exceeded the F&W single sample criterion during the May and June sampling events.

As part of the assessment process, ADEM will review the monitoring information presented in this report, along with all other available data.

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