Alabama Department of Environmental Management

Basin Assessment Site

Rivers and Streams Monitoring Program

2015 Monitoring Summary

Fair

Big Flat Creek at AL Highway 41 (Monroe County) (31.60811/-87.41481)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected Big Flat Creek for biological and water quality monitoring as part of the 2015 Rivers and Streams Monitoring Project. The objectives of the project were to provide data to fully assess each monitoring site and to estimate overall water quality statewide using macroinvertebrate and habitat surveys and intensive water quality data.

Figure 1. Big Flat Creek at BFLM-3, May 6, 2015.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Located in the Alabama River Basin, Big Flat Creek is designated as a *Swimming/ Fish & Wildlife (S/ F&W)* stream. Big Flat Creek at BFLM-3 is a riffle-run stream that drains a 247 square mile watershed through Monroe County in the Buhrstone/ Lime Hills ecoregion (65q). Based on the 2011 National Land Cover Dataset, land use within the watershed is composed of forest (68%), with some woody wetlands and shrub/scrub. Population density is low, and less than 5% of the watershed area is developed. As of April 1, 2016, there were 30 permitted outfalls active in 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. Big Flat Creek at BFLM-3 is riffle-run stream characterized by a bedrock bottom substrate (Figure 1). Macrophytes, primarily Justicia, were also prevalent (35%) throughout the reach. Overall habitat quality was rated as *optimal.*

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 in comparison to least impaired reference reaches in the same ecoregion. The final score is the average of the individual metric scores. The metric results indicated the macroinvertebrate community to be in *fair* condition (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Alabama River
Drainage Area (mi^2)		247
Ecoregion[a]		65Q
% Landuse[b]		
Open water		<1%
Wetland	Woody	12%
	Emergent herbaceous	<1%
Forest	Deciduous	29%
	Evergreen	33%
	Mixed	6%
Shrub/scrub		11%
Grassland/herbaceous		4%
Pasture/hay		2%
Cultivated crops		<1%
Development	Open space	2%
	Low intensity	<1%
	Moderate intensity	<1%
	High intensity	<1%
Barren		<1%
Population/km^2[c]		3
# NPDES Permits[d]	**TOTAL**	30
Construction		24
Industrial General		5
Municipal		1

a. Buhrstone/Lime Hills

b. 2011 National Land Cover Dataset

c. 2010 US Census

d. #NPDES outfalls downloaded from ADEM's NPDES Management System database, April 1, 2016.

Table 2. Physical characteristics of Big Flat Creek at BFLM-3, May 6, 2015.

Physical Characteristics	
Width (ft)	40
Canopy Cover	Mostly Open
Depth (ft)	
Riffle	1.0
Run	1.5
Pool	1.0
% of Reach	
Riffle	70
Run	25
Pool	5
% Substrate	
Bedrock	75
Boulder	1
Cobble	9
Gravel	10
Sand	2
Silt	3

Table 3. Results of the habitat assessment conducted on Big Flat Creek at BFLM-3, May 6, 2015.

Habitat Assessment	% Maximum Score	Rating
Instream Habitat Quality	80	Optimal (>79)
Sediment Deposition	76	Sub-Optimal (55-79)
Riffle frequency	80	Optimal (>79)
Bank Vegetative Stability	79	Sub-Optimal (58-79)
Riparian Buffer	85	Optimal (>84)
Habitat Assessment Score	**160**	
% of Maximum Score	**84**	**Optimal (>80)**

Table 4. Results of the macroinvertebrate bioassessment conducted in Big Flat Creek at BFLM-3, May 6, 2015.

Macroinvertebrate Assessment	
	Results
Taxa richness and diversity measures	
# Ephemeroptera (mayfly) taxa	8
# Plecoptera (stonefly) taxa	3
# Trichoptera (caddisfly) taxa	6
Taxonomic composition measures	
% Non-insect taxa	13
% Plecoptera	1
% Non-insect organisms	0
Community tolerance	
Becks community tolerance index	12
WMB-I Assessment Score	**52**
WMB-I Assessment Rating	**Fair**

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. *In situ* measurements and water samples were collected monthly or semi-monthly (metals) from March through October of 2015 to help identify any stressors to biological communities. *In situ* parameters suggested Big Flat Creek at BFLM-3 was meeting its *S/F&W* water use classification. However, median values for conductivity, hardness, alkalinity, and total and dissolved manganese were higher than expected based on data collected from reference reaches within ecoregion 65q.

SUMMARY

As part of the assessment process, ADEM will review the monitoring information presented in this report, along with all other available data. Although habitat quality and availability within the reach was *optimal* for supporting aquatic communities, the macroinvertebrate community was in *fair* condition. Specific conductivity, hardness, alkalinity and total and dissolved manganese were higher than expected. Monitoring should continue to ensure that water quality and the biological community remain stable.

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Table 5. Summary of water quality data collected March-October, 2015. Minimum (Min) and maximum (Max) values calculated using minimum detection limits (MDL). Median (Med), 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	Q
Physical							
Temperature (°C)	8	15.8	28.3	23.0	22.3	5.4	
Turbidity (NTU)	8	4.9	22.9	13.8	13.1	6.1	
Total Dissolved Solids (mg/L)	7	70.0	88.0	84.0	80.4	7.0	
Total Suspended Solids (mg/L)	6	4.0	7.0	6.5	5.8	1.0	
Specific Conductance (µmhos/cm@25C)	8	82.0	113.1	99.5 G	98.0	11.9	
Hardness (mg/L)	3	37.2	42.0	37.5 G	38.9	2.7	
Alkalinity (mg/L)	7	22.8	48.2	42.6 M	37.6	10.8	
Monthly Stream Flow (cfs)	6	4.9	74.1	10.4	24.5	27.9	
Stream Flow during Sample Collection (cfs)	6	4.9	74.1	10.4	24.5	27.9	
Chemical							
Dissolved Oxygen (mg/L)	8	6.0	9.5	7.9	7.7	1.2	
pH (SU)	8	6.6	7.4	7.1	7.0	0.3	
J Ammonia Nitrogen (mg/L)	7	< 0.007	0.027	0.005	0.008	0.008	
J Nitrate+Nitrite Nitrogen (mg/L)	7	< 0.001	0.047	0.013	0.020	0.018	
J Total Kjeldahl Nitrogen (mg/L)	7	0.100	0.619	0.422	0.383	0.182	
J Total Nitrogen (mg/L)	7	0.140	0.620	0.435	0.403	0.165	
J Dissolved Reactive Phosphorus (mg/L)	7	0.006	0.011	0.008	0.008	0.002	
Total Phosphorus (mg/L)	7	0.028	0.042	0.034	0.035	0.005	
CBOD-5 (mg/L)	7	< 2.0	< 2.0	1.0	1.0	0.0	
Chlorides (mg/L)	7	3.2	4.4	3.7	3.7	0.4	
Total Metals							
J Aluminum (mg/L)	3	< 0.106	0.179	0.053	0.095	0.073	
Iron (mg/L)	3	1.030	2.130	1.400	1.520	0.560	
J Manganese (mg/L)	3	0.069	0.177	0.163 M	0.136	0.059	
Dissolved Metals							
Aluminum (mg/L)	3	< 0.106	< 0.106	0.053	0.053	0.000	
Antimony (µg/L)	3	< 0.3	< 0.3	0.2	0.2	0.0	
J Arsenic (µg/L)	3	0.7	1.2 H	1.2	1.0	0.3	3
Cadmium (µg/L)	3	< 0.311	< 0.311	0.156	0.156	0.000	
J Chromium (mg/L)	3	< 0.0003	0.0004	0.0004	0.0004	0.0001	
J Copper (mg/L)	3	< 0.0002	0.001	0.0005	0.001	0.000	
Iron (mg/L)	3	0.769	1.460	1.020	1.083	0.350	
Lead (µg/L)	3	< 0.4	< 0.4	0.2	0.2	0.0	
J Manganese (mg/L)	3	0.049	0.137	0.122 M	0.103	0.047	
J Nickel (mg/L)	3	0.0005	0.001	0.001	0.001	0.000	
Selenium (µg/L)	3	< 0.4	< 0.4	0.2	0.2	0.0	
Silver (µg/L)	3	< 0.365	< 0.365	0.182	0.182	0.000	
Thallium (µg/L)	3	< 0.5	< 0.5	0.2	0.2	0.0	
J Zinc (mg/L)	3	< 0.0005	0.047	0.002	0.016	0.026	
Biological							
Chlorophyll a (mg/m³)	7	< 1.00	5.00	2.14	2.13	1.83	
J E. coli (MPN/DL)	7	14.5	62.4	39.9	34.2	16.7	

G=value higher than median concentration of all verified ecoregional reference reach data collected in the ecoregion 65q; H=*S/F&W* human health criterion exceeded; J=estimate; M=values greater than the 90th percentile of all verified reference reach data collected in ecoregion 65q; N=# of samples; Q=# of uncertain criterion exceedances.