Alabama Department of Environmental Management

Basin Assessment Site

Rivers and Streams Monitoring Program

2009 Monitoring Summary

Flint Creek at Nanceford Bridge in Morgan County (34.40571/-86.97614)

BACKGROUND

Flint Creek from AL Highway 67 to its source was added to Alabama's Clean Water Act (CWA) §303(d) list of impaired waters in 1996. It was listed for siltation, organic enrichment (OE) and low dissolved oxygen (DO) concentrations, pathogens, and nutrient enrichment from municipal sources, nonirrigated crop production, pasture grazing, intensive animal feeding operations, and urban runoff/ storm sewers. Total Maximum Daily Loads (TMDLs) for each of these pollutants were approved by the Environmental Protection Agency (EPA) in September 2003.

The Alabama Department of Environmental Management (ADEM) selected the Flint Creek watershed for biological and water quality monitoring as part of the 2009 Assessment of the Tennessee (TN) River Basin. The objectives of this project were to assess the biological integrity of each monitoring site and to estimate overall water quality within the Tennessee River basin. Habitat and macroinvertebrate assessments are usually conducted to meet these objectives. However, Flint Creek at FTCM-4 was not wadeable, and biological assessments could not be conducted at this reach (Figure 1).

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Flint Creek from AL Highway 36 to Shoal Creek is a *Limited Warmwater Fishery (LWF)* stream located in Morgan County near Falkville. Based on the 2000 National Land Cover Dataset, landuse within the watershed is primarily forest (36%) and agriculture (44%). Due to the stream's proximity to Hartselle, population density is higher than that of watersheds in more rural areas. Approximately 9% of the area is developed. As of Febraury 23, 2011, ADEM has issued a total of 113 NPDES permits in the watershed.

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 2. In situ measurements and water samples were collected monthly, semi-monthly or quarterly during March through October of 2009 to help identify any stressors to the biological communities. Dissolved oxygen concentrations were below *LWF* criteria in July and August. Concentrations of dissolved arsenic also appeared to be above standard *LWF* criteria in three of four samples. Dissolved mercury concentrations exceeded *LWF* criteria in one of two samples. Two additional mercury samples did not meet ADEM's laboratory QC requirements and were excluded from analyses. All ammonia-nitrogen, total kjeldahl nitrogen, total nitrogen, and total phosphorus samples collected between March and July, as well as the nitrate-nitrite sample collected in July, were also excluded due to laboratory QC results. Total suspended solids, nutrients (total kjeldahl nitrogen, dissolved reactive phosphorus, and total phosphorus) and metals (total aluminum, total iron, total manganese, dissolved aluminum, dissolved iron, dissolved manganese, zinc) concentrations, and chlorides exceeded background levels based on the 90th percentile of data collected at reference reaches in the ecoregion; specific conductance and hardness exceeded background levels based on the median of data from these reference reaches. No stream flow measurements were recorded for Flint Creek at FTCM-4 due to non-wadeable conditions.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Tennessee River
Drainage Area (mi^2)		147
Ecoregion[a]		71g
% Landuse		
Open water		<1
Wetland	Woody	2
	Emergent herbaceous	<1
Forest	Deciduous	28
	Evergreen	4
	Mixed	4
Shrub/scrub		7
Grassland/herbaceous		2
Pasture/hay		37
Cultivated crops		7
Development	Open space	5
	Low intensity	2
	Moderate intensity	1
	High intensity	<1
Barren		<1
Population/km^2[b]		3184
# NPDES Permits[c]	**TOTAL**	113
401 Water Quality Certification		1
Construction Stormwater		85
Mining		5
Industrial General		10
Industrial Individual		4
Municipal Individual		5
Underground Injection Control		3

a. Eastern Highland Rim
b. 2000 US Census
c. #NPDES permits downloaded from ADEM's NPDES Management System database, February 23, 2011

Figure 1. Flint Creek at FTCM-4, July 4, 2010.

SUMMARY

Monthly water quality samples collected in Flint Creek at FTCM-4 indicated nutrient and metals concentrations to be higher than expected in the stream. Dissolved oxygen concentrations were also below *LWF* use classification criertia in July and August. However, because the stream was not wadeable, habitat and macroinvertebrate assessments were not conducted at the site. Monitoring should continue to ensure that water quality and biological conditions are satisfactory.

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Table 2. Summary of water quality data collected March-October, 2009. 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	Q
	Physical								
	Temperature (°C)	8	13.7	25.7	20.4	19.9	4.8		
	Turbidity (NTU)	8	8.3	59.0	18.4	26.9	18.6		
	Total Dissolved Solids (mg/L)	8	77.0	183.0	123.0	128.6	33.0		
	Total Suspended Solids (mg/L)	8	6.0	67.0	16.5 M	24.6	22.1		
	Specific Conductance (µmhos)	8	124.0	270.0	191.0 G	194.6	57.8		
	Hardness (mg/L)	4	53.7	193.0	97.8 G	110.6	58.8		
J	Alkalinity (mg/L)	8	51.3	112.0	74.2	81.4	25.2		
	Chemical								
	Dissolved Oxygen (mg/L)	8	3.7 C	9.0	6.5	6.2	1.8	2	
	pH (su)	8	7.3	7.8	7.4	7.5	0.2		
B	Ammonia Nitrogen (mg/L)	3	< 0.006	0.025	0.003	0.010	0.013		
B	Nitrate+Nitrite Nitrogen (mg/L)	7	< 0.003	2.703	0.573	0.856	0.907		
B	Total Kjeldahl Nitrogen (mg/L)	3	0.263	0.916	0.794 M	0.658	0.347		
B	Total Nitrogen (mg/L)	3	0.836	1.907	1.146	1.296	0.551		
J	Dissolved Reactive Phosphorus (mg/L)	8	0.076	0.342	0.150 M	0.162	0.093		
B	Total Phosphorus (mg/L)	3	0.133	0.224	0.212 M	0.190	0.049		
J	CBOD-5 (mg/L)	8	< 1.0	2.6	0.5	0.9	0.8		
	Chlorides (mg/L)	8	2.0	10.2	2.9 M	4.2	3.0		
	Atrazine (µg/L)	2	< 0.06	0.10	0.06	0.06	0.05		
	Total Metals								
	Aluminum (mg/L)	4	0.871	1.860	1.186 M	1.276	0.466		
	Iron (mg/L)	4	0.732	1.620	1.078 M	1.127	0.385		
	Manganese (mg/L)	4	0.051	0.179	0.152 M	0.134	0.058		
	Dissolved Metals								
J	Aluminum (mg/L)	4	< 0.060	0.204	0.080 M	0.098	0.085		
	Antimony (µg/L)	4	< 0.5	< 6.0	3.0	2.3	1.4		
J	Arsenic (µg/L)	4	< 0.4	2.0 H	0.8	0.9	0.8		3
	Cadmium (mg/L)	4	< 0.001	< 0.002	0.001	0.001	0.000		
	Chromium (mg/L)	4	< 0.007	< 0.007	0.004	0.004	0.000		
	Copper (mg/L)	4	< 0.200	< 0.200	0.100	0.100	0.000		
J	Iron (mg/L)	4	0.063	0.275	0.231 M	0.200	0.095		
	Lead (µg/L)	4	< 1.5	< 1.5	0.8	0.8	0.0		
J	Manganese (mg/L)	4	0.018	0.140	0.080 M	0.079	0.057		
B	Mercury (µg/L)	2	< 0.1	0.3 AH	0.2	0.2	0.2	1	
	Nickel (mg/L)	4	< 0.008	< 0.008	0.004	0.004	0.000		
	Selenium (µg/L)	4	< 0.4	< 0.4	0.2	0.2	0.0		
	Silver (mg/L)	4	< 0.001	< 0.001	0.000	0.000	0.000		
	Thallium (µg/L)	4	< 0.4	< 0.4	0.2	0.2	0.0		
	Zinc (mg/L)	4	< 0.060	< 0.060	0.030 M	0.030	0.000		
	Biological								
J	Chlorophyll a (ug/L)	8	< 1.00	9.08	1.60	2.40	2.82		
J	Fecal Coliform (col/100 mL)	8	76	2600 H	374	605	842	1	
J	E. coli (col/100mL)	2	145	2420 H	1282	1282	1608	1	

B= Samples excluded due to laboratory QC concerns; C=*LWF* criterion violated; E=# samples that exceeded criteria; G=value higher than median concentration of all verified ecoregional reference reach data collected in the ecoregion 71; H=*LWF* human health criteria exceeded; J=estimate; M=value >90% of all verified ecoregional reference reach data collected in the ecoregion 71; N=# samples; Q= # of uncertain exceedances.