

2009 Monitoring Summary

Elam Creek at Alabama Hwy 157 (Lawrence County) (34.45275/-87.22795)

BACKGROUND

Elam Creek was placed on Alabama's 1998 Clean Water Act (CWA) §303(d) list of impaired waters for not meeting the *Fish & Wildlife (F&W)* water use classification criterion for dissolved oxygen. It was listed for organic enrichment and dissolved oxygen (OE/DO), based on data collected in 1994 and 1995. As mandated by the Environmental Protection Agency (EPA), a total maximum daily load (TMDL) estimate was developed by the Alabama Department of Environmental Management (ADEM) and approved by EPA in 2003.

A Section §319 grant-funded Watershed Management Plan (WMP) was developed and implemented to reduce instream nutrient loading and soil erosion in the West Flint Creek Watershed, which includes Elam Creek. Based on Tennessee Valley Authority (TVA) model data, the non-point source BMP implementation project is expected to result in organic enrichment pollutant load reductions of 20% and sediment load reductions of 42.7%. An estimated four miles of stream bank will be restored through animal exclusion and restoration of riparian buffer zones.

In 2009, the ADEM collected water chemistry samples monthly from Elam Creek at ELML-1 to document instream condition prior to implementation of the WMP. A Habitat assessment and benthic macroinvertebrate bioassessment were also requested but could not be conducted due to no-flow conditions in Elam Creek.



Figure 1. Elam Creek at ELML-1 taken November 19, 2009.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Elam Creek is a *Fish & Wildlife (F&W)* stream located in the *Eastern Highland Rim* sub-ecoregion. It drains approximately 19 mi² in Lawrence County. Based on the 2006 National Land Cover Dataset, land use within the watershed is primarily pasture/hay and forest (32%). Population density is moderate and less than 7% of the area is developed. As of May 13, 2013, there were three NPDES permitted outfalls active in the watershed.

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 2. In situ measurements and water samples were collected monthly from March through October of 2009 to identify any stressors to the biological community. Two fecal coliform samples exceeded the *F&W* use classification criteria of 2000 colonies/100 ml of sample in May and October. Median values for specific conductance, hardness, alkalinity, total Kjeldahl nitrogen, dissolved reactive phosphorus, and total phosphorus, as well as for chlorides, total and dissolved aluminum, total and dissolved iron, and total and dissolved manganese, were higher than expected for streams in the *Interior Plateau* ecoregion (71). Organics results were less than the Minimum Detection Limit (MDL), except for atrazine, a commonly used herbicide.

SUMMARY

The status of the instream habitat and the macroinvertebrate communities in Elam Creek at ELAM-1 could not be determined in 2009, due to "standing pool" conditions at the time of the scheduled sampling event. Also, rain events in March, April, May, and October prior to sampling elevated water levels, prevented flow measurements and may have affected water quality results. However, fecal coliform samples exceeded the *F&W* criterion in May and October. Median values for chlorides, total Kjeldahl nitrogen, dissolved reactive phosphorus and total phosphorus were above expected values. Median total and dissolved values for aluminum, iron, and manganese were also greater than expected.

Monitoring should continue to ensure that water quality and biological conditions meet current standards.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin	Tennessee River	
Drainage Area (mi²)	19	
Ecoregion^a	71g	
% Landuse		
Open water		<1
Wetland	Woody	8
Forest	Deciduous	19
	Evergreen	7
	Mixed	6
Shrub/scrub		5
Grassland/herbaceous		1
Pasture/hay		41
Cultivated crops		9
Development	Open space	5
	Low intensity	<1
	Moderate intensity	<1
Barren		19
Population/km^{2b}	81	
# NPDES Permits^c	TOTAL	3
	Construction Stormwater	3

a. Eastern Highland Rim

b. 2000 US Census

c. #NPDES permits downloaded from ADEM's NPDES Management System database, May 13, 2013.

Table 2. Summary of water quality data collected March-October, 2009. 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.

Parameter	N	Min	Max	Med	Avg	SD	E	Q
Physical								
Temperature (°C)	8	13.2	25.1	20.0	19.8	4.0		
Turbidity (NTU)	8	3.5	182.0	12.6	40.2	61.2		
^J Total Dissolved Solids (mg/L)	8	112.0	204.0	145.0	152.5	30.4		
^J Total Suspended Solids (mg/L)	8	1.0	100.0	7.0	25.6	37.1		
Specific Conductance (µmhos)	8	123.1	363.5	238.6 ^G	241.6	78.3		
Hardness (mg/L)	4	61.3	176.0	121.0 ^G	119.8	47.7		
Alkalinity (mg/L)	8	57.3	171.0	110.2 ^M	112.6	37.6		
Stream Flow (cfs)	4	1.1	17.1	10.8	10.0	6.6		
Chemical								
Dissolved Oxygen (mg/L)	8	5.4	9.3	6.7	6.9	1.2		
pH (su)	8	7.2	7.6	7.5	7.5	0.1		
^B Ammonia Nitrogen (mg/L)	7	< 0.006	0.070	0.007	0.019	0.024		
^J Nitrate+Nitrite Nitrogen (mg/L)	8	0.234	1.635	0.706	0.780	0.445		
^B Total Kjeldahl Nitrogen (mg/L)	7	< 0.089	1.152	0.660 ^M	0.596	0.351		
^B Total Nitrogen (mg/L)	7	< 0.778	1.948	1.337	1.364	0.378		
^J Dissolved Reactive Phosphorus (mg/L)	8	0.023	0.143	0.054 ^M	0.065	0.040		
^B Total Phosphorus (mg/L)	7	0.025	0.286	0.090 ^M	0.131	0.092		
CBOD-5 (mg/L)	8	< 1.0	< 2.0	1.0	0.9	0.2		
Chlorides (mg/L)	8	1.5	5.6	3.0 ^M	3.3	1.3		
Atrazine (µg/L)	2	0.06	0.16	0.11	0.11	0.07		
Total Metals								
^J Aluminum (mg/L)	4	0.187	6.100	0.507 ^M	1.825	2.856		
^J Iron (mg/L)	4	0.108	4.050	0.480 ^M	1.280	1.856		
^J Manganese (mg/L)	4	0.045	0.230	0.053 ^M	0.095	0.090		
Dissolved Metals								
^J Aluminum (mg/L)	4	0.041	0.266	0.048 ^M	0.098	0.113		
Antimony (µg/L)	4	< 0.7	< 6.0	0.4	1.0	1.3		
^J Arsenic (µg/L)	4	< 0.4	< 0.4 ^H	0.2	0.3	0.1		1
Cadmium (mg/L)	4	< 0.002	< 0.003	0.002	0.001	0.000		
Chromium (mg/L)	4	< 0.007	< 0.013	0.006	0.006	0.002		
Copper (mg/L)	4	< 0.013	< 0.200	0.006	0.030	0.047		
^J Iron (mg/L)	4	0.019	0.187	0.090 ^M	0.096	0.069		
Lead (µg/L)	4	< 1.0	< 1.5	0.5	0.6	0.1		
^J Manganese (mg/L)	4	0.019	0.043	0.030 ^M	0.031	0.010		
^B Mercury (µg/L)	3	< 0.1	< 0.080	0.0	0.0	0.0		
Nickel (mg/L)	4	< 0.004	< 0.019	0.003	0.004	0.004		
Selenium (µg/L)	4	< 0.4	< 0.4	0.2	0.2	0.0		
Silver (mg/L)	4	< 0.001	< 0.002	0.001	0.001	0.000		
Thallium (µg/L)	4	< 0.4	< 0.4	0.2	0.2	0.0		
^J Zinc (mg/L)	4	< 0.003	< 0.060	0.010	0.013	0.013		
Biological								
Chlorophyll a (ug/L)	8	0.71	2.67	1.07	1.20	0.69		
^J Fecal Coliform (col/100 mL)	8	56	> 17,000 ^C	365	3,081	5,973	2	

B=One or more samples excluded from calculations because they did not meet laboratory QC requirements; C=F&W criterion exceeded; E=# samples that exceed criterion; G=value greater than median concentration of all verified reference data collected in ecoregion 71; H=F&W human health criterion exceeded; J=estimate; N=# samples; M=value > 90th percentile of all verified reference data collected in ecoregion 71; Q=# of uncertain criteria exceedances.

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