

2015 Monitoring Summary

Brush Creek at US Hwy 80 in Dallas County (32.43883/-87.37375)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Brush Creek watershed for biological and water quality monitoring as part of the 2015 Use Support Assessment of the Alabama River Basin. This watershed was selected as part of the assessment in order to verify water quality conditions in Brush Creek and to determine if the stream was meeting its use classification criteria. Monthly water chemistry samples were planned for Brush Creek at BRSD-18, as were habitat and macroinvertebrate community assessments. However, a lack of measurable flow during much of the year restricted the number of water quality samples collected, and precluded the habitat and macroinvertebrate assessments.



Figure 1. Brush Creek at BRSD-18, June 12, 2015.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Brush Creek at BRSD-18 is a *Fish and Wildlife (F&W)* stream that drains approximately 21 square miles in Perry and Dallas Counties. Based on the 2011 National Land Cover Dataset, landuse within the watershed is primarily pasture/hay, wetland (17%), forest (13%), and cultivated crops. The percentage of developed land is less than 8%, and population density is low. As of April 1, 2016, 26 NPDES outfalls were active in the watershed (ADEM NPDES Management System).

WATER CHEMISTRY

Water chemistry results are summarized in Table 2. Water samples and in situ measurements were planned for monthly collection, from March through October 2015, to help identify stressors to the biological community of Brush Creek at BRSD-18. However, samples were only collected on three occasions (March, April, and May), due to stagnant flow conditions during every subsequent visit. Metals, atrazine, and hardness were sampled April 15, 2015. Organics were also sampled in April; all results were below the minimum detection limit. Dissolved arsenic concentrations exceeded the *F&W* human-health criterion for fish consumption in April. Median specific conductance was higher than values recorded from all verified ecoregional reference reaches. Median total suspended solids, total kjeldahl nitrogen, and total nitrogen concentrations were higher than the 90th percentile of reference reach data collected in ecoregion 65A.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		Alabama River
Basin		
Drainage Area (mi²)		21
Ecoregion^a		65A
Landuse^b		
Open water		2%
Wetland	Woody	11%
	Emergent herbaceous	6%
Forest	Deciduous	3%
	Evergreen	9%
	Mixed	1%
Shrub/scrub		5%
Grassland/herbaceous		2%
Pasture/hay		45%
Cultivated crops		10%
Development	Open space	5%
	Low intensity	<1%
	Moderate intensity	<1%
	High intensity	<1%
Barren		<1%
Population/km^{2c}		2
# NPDES Permits^d	TOTAL	26
	Construction	24
	Industrial General	2

a. Blackland Prairie

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. Summary of water quality data collected March-October, 2015. 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
Physical							
Temperature (°C)	3	16.6	20.8	19.5	19.0	2.1	
Turbidity (NTU)	4	24.7	91.4	68.9	63.5	27.9	
Total Dissolved Solids (mg/L)	3	125.0	159.0	126.0	136.7	19.3	
Total Suspended Solids (mg/L)	3	31.0	103.0	53.0 ^M	62.3	36.9	
Specific Conductance (µmhos/cm)	3	138.3	213.8	186.2 ^G	179.4	38.2	
Hardness (mg/L)	1				100.0		
Alkalinity (mg/L)	3	49.3	79.5	74.0	67.6	16.1	
Monthly Stream Flow (cfs)	9	0.0	17.3	0.0	2.4	5.8	
Measured Stream Flow (cfs)	2	4.1	17.3	10.7	10.7	9.3	
Chemical							
Dissolved Oxygen (mg/L)	3	6.9	9.7	8.5	8.4	1.4	
pH (SU)	3	7.0	7.3	7.1	7.2	0.2	
Ammonia Nitrogen (mg/L)	3	0.034	0.192	0.041	0.089	0.089	
Nitrate+Nitrite Nitrogen (mg/L)	3	< 0.002	0.451	0.045	0.166	0.248	
Total Kjeldahl Nitrogen (mg/L)	3	1.020	1.780	1.190 ^M	1.330	0.399	
Total Nitrogen (mg/L)	3	< 1.065	2.231	1.191 ^M	1.496	0.640	
^J Dis Reactive Phosphorus (mg/L)	3	0.007	0.059	0.013	0.026	0.028	
Total Phosphorus (mg/L)	3	0.054	0.151	0.091	0.099	0.049	
CBOD-5 (mg/L)	3	< 2.0	< 2.0	1.0	1.0	0.0	
Chlorides (mg/L)	3	7.3	11.4	8.9	9.2	2.1	
Atrazine (µg/L)	1				< 0.10		
Total Metals							
Aluminum (mg/L)	1				4.300		
Iron (mg/L)	1				3.280		
^J Manganese (mg/L)	1				0.023		
Dissolved Metals							
Aluminum (mg/L)	1				0.311		
Antimony (µg/L)	1				< 0.342		
Arsenic (µg/L)	1				1.463 ^H		1
Cadmium (µg/L)	1				< 0.311		
Chromium (µg/L)	1				1.001		
Copper (µg/L)	1				2.026		
Iron (mg/L)	1				0.513		
Lead (µg/L)	1				< 0.428		
Manganese (mg/L)	1				< 0.004		
Nickel (µg/L)	1				2.045		
Selenium (µg/L)	1				< 0.395		
Silver (µg/L)	1				< 0.365		
Thallium (µg/L)	1				< 0.514		
Zinc (µg/L)	1				3.963		
Biological							
Chlorophyll a (mg/m ³)	3	< 1.00	8.00	1.60	3.37	4.05	
E. coli (MPN/DL)	3	32.7	870.4	410.6	437.9	419.5	

E=# samples that exceeded criteria; J=estimate; N=# samples; M=value > 90% of ADEM's verified reference reaches collected in ecoregion 65A; G=value higher than median of all verified ecoregional reference reach data collected in ecoregion 65A; H=F&W human health criterion exceeded.

SUMMARY

Median specific conductance, total suspended solids, total kjeldahl nitrogen, and total nitrogen concentrations were all higher than expected for ecoregion 65A. Dissolved arsenic concentrations exceeded the *F&W* human-health criterion for fish consumption in April. Monitoring should continue to ensure that conditions remain stable within the reach.

Although samples of total dissolved arsenic were above expected values in Brush Creek, ADEM criteria for arsenic are expressed as dissolved trivalent arsenic (arsenite—As III). Presently, studies are being conducted in order to provide a better understanding of the prevalence and areal distribution of dissolved trivalent arsenic to total arsenic in the State of Alabama. Upon conclusion of the studies, Brush Creek will be reassessed for potential arsenic violations.

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