Alabama Department of Environmental Management

Ecological Reference Reach

Rivers and Streams Monitoring Program™

2019 Monitoring Summary

Excellent-Good

Oakmulgee Creek at AL Highway 14 in Dallas County(32.48057/-87.12696)

BACKGROUND

Oakmulgee Creek is among the least-disturbed watersheds within the Southeastern Floodplains and Low Terraces ecoregion, based on landuse, road density, and population density. The Alabama Department of Environmental Management (ADEM) monitored this stream as a candidate "high quality" reference watershed for comparison with other streams within the ecoregion. Data from reference watersheds are used to characterize natural or background conditions expected in different ecoregions throughout the state. Oakmulgee Creek was sampled in 2019 to provide high-quality reference reach data for Floodplains and Low Terraces streams (65p) which comprise the majority of the watershed.

Oakmulgee Creek is within one of 50 Strategic Habitat Units (SHU) by the U.S. Fish and Wildlife Service (USFWS) and the Alabama Rivers & Streams Network (ARSN). SHUs are recognized as high quality habitats occupied by federally listed and state imperiled species.

Figure 1. Oakmulgee Creek at OKGD-3, June 20, 2019.

Table 1. Summary of general watershed characteristics: OKGD-3 (2018)

Watershed Characteristics	
Basin	Cahaba
Drainage Area (mi²)	233.4
Ecoregion°	65p
Assessment Unit	AL03150202-0805-100
Use Class	
AU Category	
12-digit Hydrologic Unit Code (HUC)	031502020805
Conservation Status	
Strategic Habitat Unit †	27 Cahaba River
Landuse Categories (2011 National Land Cover Dataset)	
Open Water (%)	0.2
Wetland, Total (%)	5.2
Wetlands, Woody (%)	5.0
Wetlands, Emergent Herbaceous (%)	0.2
Forested, Total (%)	71.8
Forested, Deciduous (%)	26.5
Forested, Evergreen (%)	28.3
Forested, Mixed (%)	17.0
Shrub/Scrub (%)	12.5
Grassland/Herbaceous (%)	2.1
Pasture/Hay (%)	3.8
Crops, Cultivated (%)	1.1
Developed, Total (%)	3.4
Developed, Open Space (%)	3.2
Developed, Low Intensity (%)	0.1
Population/km (2010 US Census)	3
Roads	
Road Density	1.0
# Road Crossings per Stream km	0.3
Watershed Disturbance Score*	**58**
Watershed Disturbance Category*	**3**

° Southeastern Floodplains And Low Terraces

† 12-digit HUC located in a Strategic Habitat Unit.

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

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Oakmulgee Creek is a *Fish and Wildlife (F&W)* stream located in Dallas county near Selma, Alabama. According to the 2011 National Land Cover Dataset, the watershed is over 71% forested with no permitted outfalls. It is sparsely populated with very few roads. It is located within a Strategic Habitat Unit that supports federally listed threatened or endangered aquatic species and other aquatic species listed to be of the *Highest* or *High Conservation Concern* by the state of Alabama.

REACH CHARACTERISTICS

General observations (Figure 1, 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. Like other streams in ecoregion 65p, Oakmulgee Creek at OKGD-3 is a medium gradient stream characterized predominantly by a cobble, gravel and sand substrate. Overall habitat quality was categorized as *sub-optimal/optimal* for supporting the biological communities in this stream type.

Table 2. Physical characteristics of Oakmulgee Creek at OKGD-3, June 20, 2019.

Physical Characteristics	
Width (ft)	45
Canopy Cover	Estimate 50/50
Depth (ft)	
Riffle	0.3
Run	1.5
Pool	2.5
% of Reach	
Riffle	5
Run	75
Pool	20
% Substrate	
Cobble	12
Gravel	35
Sand	40
Silt	5
Organic Matter	8

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*. Biological survey results indicate the macroinvertebrate community to be in *excellent-good* condition. Sixty-two total taxa were collected, including six highly sensitive taxa (attribute 2), twenty-two additional sensitive taxa (attribute 3), and twelve sensitive EPT taxa (Table 4).

Table 3. Results of the habitat assessment survey conducted on Oakmulgee Creek at OKGD-3, June 20, 2019.

Habitat Survey	% Max Score	Rating
Instream Habitat Quality	78	Sub-optimal/Optimal (75-79.999)
Sediment Deposition	75	Sub-optimal/Optimal (75-79.999)
Riffle Frequency	83	Optimal (80-100)
Bank Vegetative Stability	73	Sub-optimal (55-74.999)
Riparian Zone Measurements	90	Optimal (80-100)
Habitat Assessment Score	**159**	
% Maximum Score	**79**	**Sub-optimal/Optimal (70-84.999)**

Table 4. Results of the Macroinvertebrate survey conducted on Oakmulgee Creek at OKGD-3, 06/20/2019.

Macroinvertebrate Assessment	Results	Scores
Taxonomic richness and diversity metrics		
Taxa Count	62	62
# rare and highly sensitive taxa	6	6
# sensitive taxa	22	22
# sensitive EPT taxa	12	12
Percent taxon metrics		
% rare and highly sensitive taxa	10	10
% sensitive taxa	35	35
% sensitive EPT taxa	19	19
% highly tolerant taxa	5	5
Percent individual metrics		
% rare and highly sensitive individuals	3	3
% sensitive individuals	16	16
% sensitive EPT individuals	12	12
% tolerant individuals	19	19
WMB-I Survey Score		**2.5**
WMB-I Survey Rating		**Excellent-good (2.15-2.499)**

WATER CHEMISTRY

Results of water chemistry analyses are summarized in Table 5. In situ measurements and water samples were collected monthly and semi-monthly (metals), from March through October 2019 to help characterize the reach. Individual *E. coli* counts exceeded the criterion for the *F&W* use classification during two sampling events. Six individual pH values were less than 6.0.

SUMMARY

The ADEM monitored Oakmulgee Creek at OKGDL-3 as a candidate "high-quality" reference reach for comparison with other Floodplains and Low Terraces streams. Like other streams in ecoregion 65p, Oakmulgee Creek at OKGD-3 is a medium gradient stream characterized predominantly by a cobble, gravel and sand substrate. Overall habitat quality was categorized as *sub-optimal/optimal* for supporting the biological communities in this stream type. Individual *E. coli* counts exceeded the criterion for the *F&W* use classification during two sampling events. Six individual pH values were less than 6.0. Biological survey results indicate the macroinvertebrate community to be in *excellent-good* condition.

Table 5. Summary of water quality data collected April, June, August and October, 2019. 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.

	OKGD-3 AL03150202-0805-100	N	Min	Max	Med	Avg	SD	E	Q	10thP	90thP
	Physical										
	Temperature (°C)	8	14.2	25.6	23.4	21.9	4.0			14.2	25.6
	Turbidity (NTU)	9	6.6	62.5	15.7	22.3	18.0			6.6	62.5
	Total Dissolved Solids (mg/L)	8	8.0	45.0	29.5	29.0	10.7			8.0	45.0
	Total Suspended Solids (mg/L)	8	1.0	54.0	9.5	16.2	17.2			1.0	54.0
	Specific Conductance (µmhos/cm)	8	20.3	30.8	27.3	26.2	4.0			20.3	30.8
	Hardness (mg/L)	4	5.9	8.8	7.4	7.4	1.6			5.9	8.8
	Alkalinity (mg/L)	8	4.0	8.5	6.4	6.3	1.9			4.0	8.5
	Color (CU)	8	22	38	33	32	6			22	38
	Measured Stream Flow (cfs)	7	0.3	173.7	60.8	69.9	57.0			0.3	173.7
	Chemical										
	Dissolved Oxygen (mg/L)	8	7.4	9.7	8.0	8.2	0.8			7.4	9.7
	pH (SU)	8	5.6[C]	6.7	5.9	6.0	0.3	6		5.6	6.7
	Ammonia Nitrogen (mg/L)	8	<0.004	0.074	0.008	0.018	0.024			0.002	0.074
J	Nitrate+Nitrite Nitrogen (mg/L)	8	<0.003	0.077	0.038	0.036	0.025			0.002	0.077
	Total Kjeldahl Nitrogen (mg/L)	8	<0.200	1.210	0.252	0.338	0.368			0.100	1.210
J	Total Nitrogen (mg/L)	8	<0.137	1.236	0.255	0.374	0.362			0.137	1.236
J	Dis Reactive Phosphorus (mg/L)	8	<0.005	0.007	0.004	0.004	0.002			0.002	0.007
	Total Phosphorus (mg/L)	8	0.020	0.108	0.026	0.035	0.030			0.020	0.108
J	TOC (mg/L)	8	2.1	5.2	3.6	3.5	1.0			2.1	5.2
	Dissolved Organic Carbon (mg/L)	8	2.1	4.5	3.1	3.2	0.8			2.1	4.5
J	CBOD-5 (mg/L)	8	<2.0	<2.0	1.0	1.0	0.0			1.0	1.0
	COD (mg/L)	7	7.5	20.0	13.1	13.6	3.7			7.5	20.0
	Chlorides (mg/L)	8	1.6	2.2	1.9	1.9	0.2			1.6	2.2
	Sulfate (mg/L)	8	0.98	1.56	1.36	1.34	0.18			0.98	1.56
	Total Metals										
J	Aluminum (T) (mg/L)	4	0.146	2.120	0.472	0.802	0.910			0.146	2.120
	Iron (T) (mg/L)	4	1.690	3.800	2.255	2.500	0.947			1.690	3.800
J	Manganese (T) (mg/L)	4	0.105	0.362	0.225	0.229	0.108			0.105	0.362
	Dissolved Metals										
J	Aluminum (mg/L)	4	0.033	0.098	0.050	0.058	0.029			0.033	0.098
	Antimony (µg/L)	4	<1.480	<1.480	0.740	0.740	0.000			0.740	0.740
	Arsenic (µg/L)	4	<0.689	<0.689	0.344	0.344	0.000			0.344	0.344
	Cadmium (µg/L)	4	<0.726	<0.726	0.363	0.363	0.000			0.363	0.363
J	Chromium (µg/L)	4	<0.793	<0.793	0.396	0.496	0.199			0.396	0.794
	Copper (µg/L)	4	<1.190	<1.190	0.595	0.595	0.000			0.595	0.595
	Iron (mg/L)	4	0.516	0.900	0.682	0.695	0.202			0.516	0.900
	Lead (µg/L)	4	<0.697	<0.697	0.348	0.348	0.000			0.348	0.348
J	Manganese (mg/L)	4	0.058	0.174	0.079	0.098	0.052			0.058	0.174
	Nickel (µg/L)	4	<1.960	<1.960	0.980	0.980	0.000			0.980	0.980
	Selenium (µg/L)	4	<1.900	<1.900	0.950	0.950	0.000			0.950	0.950
	Silver (µg/L)	4	<1.350	<1.350	0.675	0.675	0.000			0.675	0.675
	Thallium (µg/L)	4	<0.641	<0.641	0.320	0.320	0.000			0.320	0.320
	Zinc (µg/L)	4	<2.340	<2.340	1.170	1.170	0.000			1.170	1.170
	Biological										
	Chlorophyll a (mg/m³)	8	<0.10	5.34	1.34	1.95	1.73			0.05	5.34
J	E. coli (MPN/DL)	8	65.0	1732.9[H]	138.2	416.6	604.4		2	65.0	1732.9

C=*F&W* criterion violated ; E=# samples that exceeded criteria; H=*F&W* human health criterion exceeded; J=estimate; Q= # of uncertain exceedances; N=# samples.

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