Alabama Department of Environmental Management

Ambient Trend Monitoring

Rivers and Streams Monitoring Program

2019 Monitoring Summary

Cahaba River at St. Clair Co Rd 10 at Whites Chapel (33.60503/-

BACKGROUND

Cahaba River at C-1 is one of a network of 94 sites monitored annually by the Alabama Department of Environmental Management (ADEM) to identify long-term trends in water quality and to provide data for the development of TMDLs and water quality criteria. Habitat and fish community assessment were conducted on Cahaba River in 2019 to assess the biological integrity of the site.

Cahaba River is within one of 50 Strategic Habitat Units (SHU) identified 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. Cahaba River at C-1, July 10, 2019.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Cahaba River at C-1 (Figure 1) lies within the Southern Sandstone Ridges (67h) ecoregion. It is a *Fish & Wildlife (F&W)* stream located in St. Clair County. According to the 2016 National Land Cover Dataset, land use within the watershed is 57% forested and 25% development.

Table 2. Physical characteristics of Cahaba River at C-1, July 3, 2019.

Physical Characteristics	
Width (ft)	50
Canopy Cover	Estimate 50/50
Depth (ft)	
Riffle	0.2
Run	0.8
Pool	1.5
% of Reach	
Riffle	20
Run	40
Pool	40
% Substrate	
Bedrock	50
Boulder	2
Cobble	3
Gravel	25
Sand	3
Silt	3
Organic Matter	14

Table 1. Summary of general watershed characteristics: C-1

Watershed Characteristics	
Basin	Cahaba
Drainage Area (mi²)	50.8
Ecoregion°	67H
Assessment Unit	AL03150202-0104-102
Use Class	F&W
AU Category	4a
12-digit Hydrologic Unit Code (HUC)	031502020101
Conservation Status	
Strategic Habitat Unit	27 Cahaba R
HUC Watershed Condition	
CWP Aquatic Resource Concerns	92
CWP Urban	80
Landuse Categories (2011 National Land Cover Dataset)	
Open Water (%)	1.2
Wetland, Total (%)	0.9
Wetlands, Woody (%)	0.9
Forested, Total (%)	57.3
Forested, Deciduous (%)	48.4
Forested, Evergreen (%)	5.0
Forested, Mixed (%)	3.9
Shrub/Scrub (%)	3.1
Grassland/Herbaceous (%)	3.6
Pasture/Hay (%)	7.8
Crops, Cultivated (%)	0.5
Developed, Total (%)	24.9
Developed, Open Space (%)	12.5
Developed, Low Intensity (%)	8.2
Developed, Medium Intensity (%)	3.2
Developed, High Intensity (%)	1.1
Barren Land (Rock, Sand, Clay) (%)	0.7
Population/km (2010 US Census)	165
NPDES outfalls (NPDES database, Jan 1, 2016)	
Total # of Permitted Outfalls	140
# of Construction Stormwater Permits	101
# of Industrial General	32
# of Industrial Individual	2
# of Municipal Permits	5
Roads	
Road Density	3.5
# Road Crossings per Stream km	1.4
Watershed Disturbance Score*	**432**
Watershed Disturbance Category*	**6**

° Southern Sandstone Ridges

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

± 12-digit HUC identified as Clean Water Partnership priority watershed.

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

REACH CHARACTERISTICS

General observations (Table 2) and a habitat survey (Table 3) were completed during the fish community assessment. In comparison with reference reaches in the same ecoregion, they give an indication of the physical condition of the site as well as the quality and availability of habitat. Cahaba River at C-1 is a high-gradient stream with bedrock and gravel. Overall habitat quality was categorized as *sub-optimal* for supporting the biological communities within this stream type.

Table 3. Results of the habitat assessment survey conducted on Cahaba River at C-1, July 3, 2019.

Habitat Survey	% Max Score	Rating
Instream Habitat Quality	74	Sub-optimal (55-74.999)
Sediment Deposition	63	Sub-optimal (55-74.999)
Riffle Frequency	83	Optimal (80-100)
Bank Vegetative Stability	65	Sub-optimal (55-74.999)
Riparian Zone Measurements	56	Sub-optimal (55-74.999)
Habitat Assessment Score	**135**	
% Maximum Score	**67**	**Sub-optimal (55-69.999)**

Table 4. Results of the Fish survey conducted on Cahaba River at C-1, July 3, 2019.

Fish Assessment	Results	Scores
Taxonomic richness and diversity metrics		
Total Native Species	23	3
Number of shiner species	4	3
Number Lepomis species	3	3
Number of darter+madtom species	6	5
Tolerance metrics		
Number of intolerant species	1	3
Percent of tolerant species	1	5
Percent Lepomis	9	5
Trophic metrics		
Percent omnivores	14	5
Percent insectivorous Cyprinids	50	3
Percent top carnivores	1	3
Abundance, condition, and reproductive metrics		
Percent DELT+hybrids	0	5
Percent simple miscellaneous	37	5
IBI Survey Score		**48**
IBI Survey Rating		**Good**

BIOASSESSMENT RESULTS

Alabama's Fish Community Index of Biotic Integrity (AL-IBI), developed through a multi-agency (GSA, ADCNR, ADEM) project to establish a comprehensive fish community bioassessment tool for wadeable streams and rivers across the state. The AL-IBI uses twelve measures of species richness and diversity, community tolerance/intolerance, and organism abundance, condition, and reproduction to assess the overall health of the fish community, based on conditions expected for wadeable streams and rivers in the Ridge and Valley Ichthyoregion. The final IBI score is the sum of all individual metrics on a 60-point scale. The fish community survey conducted at C-1 rated the site *good* (Table 4).

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. In situ measurements and water samples were collected monthly from January through December 2019 to help identify potential stressors to the biological communities. pH exceeded the criterion established for the *F&W* water use classification. Median specific conductance, alkalinity, nitrate-nitrite nitrogen, and total nitrogen values were higher than the median concentration of all verified ecoregional reference reach data collected in ecoregion 67h.

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Table 5. Summary of water quality data collected monthly January–December, 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.

	C-1 AL03150202-0104-102	N	Min	Max	Med	Avg	SD	E	10thP	90thP
	Physical									
	Temperature (°C)	13	8.6	30.0[D]	22.5	19.6	8.1		9.4	29.1
	Turbidity (NTU)	13	1.5	13.1	4.3	5.1	3.5		1.8	11.5
J	Total Dissolved Solids (mg/L)	11	81.0	224.0	135.0	134.7	40.7		83.5	193.0
	Total Suspended Solids (mg/L)	12	<1.0	9.0	3.5	3.7	2.6		0.8	7.5
	Specific Conductance (µmhos/cm)	13	128.0	411.1	246.0[G]	238.1	72.0		137.0	352.0
	Hardness (mg/L)	1				110.0			110.0	110.0
	Alkalinity (mg/L)	12	51.4	105.0	94.6[M]	87.2	18.6		55.0	104.0
	Measured Stream Flow (cfs)	13	3.7	221.0	22.2	58.4	80.3		4.1	219.0
	Chemical									
	Dissolved Oxygen (mg/L)	13	6.8[D]	12.4	10.5	10.3	1.6		7.8	12.2
	pH (SU)	13	7.5	8.6[C]	8.2	8.0	0.3	1	7.6	8.4
J	Ammonia Nitrogen (mg/L)	12	<0.004	0.046[D]	0.020	0.018	0.013		0.002	0.036
	Nitrate+Nitrite Nitrogen (mg/L)	12	0.583	5.020	1.110[M]	1.433	1.218		0.588	3.410
J	Total Kjeldahl Nitrogen (mg/L)	12	<0.075	2.800	0.229	0.570	0.800		0.038	1.985
J	Total Nitrogen (mg/L)	12	<0.620	5.259	1.692[M]	2.003	1.463		0.625	4.930
J	Dis Reactive Phosphorus (mg/L)	12	<0.006	0.042	0.012	0.015	0.011		0.004	0.035
	Total Phosphorus (mg/L)	12	0.018	0.058	0.026	0.029	0.012		0.018	0.049
J	CBOD-5 (mg/L)	12	<2.0	<2.0	1.0	1.0	0.0		1.0	1.0
J	Chlorides (mg/L)	12	2.3	40.1	6.2	9.9	10.2		2.6	26.1
J	Sulfate (mg/L)	12	6.55	17.70	9.60	10.01	2.77		7.07	14.85
	Total Metals									
J	Aluminum (T) (mg/L)	1				0.134			0.134	0.134
J	Iron (T) (mg/L)	1				0.146			0.146	0.146
	Manganese (T) (mg/L)	1				<0.004			<0.002	<0.002
	Dissolved Metals									
J	Aluminum (mg/L)	1				0.034			0.034	0.034
	Antimony (µg/L)	1				<1.480			<0.740	<0.740
	Arsenic (µg/L)	1				<0.689			<0.344	<0.344
	Cadmium (µg/L)	1				<0.726			<0.363	<0.363
	Chromium (µg/L)	1				<0.793			<0.396	<0.396
	Copper (µg/L)	1				<1.190			<0.595	<0.595
	Iron (mg/L)	1				<0.063			<0.032	<0.032
	Lead (µg/L)	1				<0.697			<0.348	<0.348
	Manganese (mg/L)	1				<0.004			<0.002	<0.002
	Nickel (µg/L)	1				<1.960			<0.980	<0.980
	Selenium (µg/L)	1				<1.900			<0.950	<0.950
	Silver (µg/L)	1				<1.350			<0.675	<0.675
	Thallium (µg/L)	1				<0.641			<0.320	<0.320
	Zinc (µg/L)	1				<2.340			<1.170	<1.170
	Biological									
	Chlorophyll a (mg/m³)	12	<0.80	5.87	0.65	1.47	1.66		0.50	4.54
	E. coli (MPN/DL)	12	34.5	275.5	100.4	111.8	70.2		37.2	223.9

C=*F&W* criterion violated; D=an individual value >90% of all verified ecoregional reference reach data collected in the ecoregion 67h; J=estimate; M=value >90% of all verified ecoregional reference reach data collected in the ecoregion 67h; G= value higher than median concentration of all verified ecoregional reference reach data collected in the ecoregion (67h); N=# samples.

SUMMARY

As part of the assessment process, ADEM will review the monitoring information presented in this report, along with all other available data.

Bioassessment results indicated the fish community to be in *good* condition. Overall habitat quality was categorized as *sub-optimal*. Results from water quality sampling indicated that pH exceeded the criterion established for the *F&W* water use classification. However, concentrations of specific conductance, alkalinity, nitrate-nitrite nitrogen, and total nitrogen were elevated as compared to data from ADEM's least-impaired reference reaches in ecoregion 67h. Monitoring should continue to ensure that water quality and biological conditions remain stable.