Alabama Department of Environmental Management

Use Support Assessment

Rivers and Streams Monitoring Program

2015 Monitoring Summary

Limestone Creek at Alabama Highway 109 in Houston County (31.09916/-85.42083)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected Limestone Creek for biological and water quality monitoring as part of the 2015 Use Support Assessment Monitoring. Limestone Creek was selected because available data and information were insufficient to determine if this water body was meeting its *F&W* use classification. The Limestone Creek watershed was also selected for water quality monitoring as part of the 2015 statewide monitoring plan. The objectives of the project were to estimate overall water quality within the basin. Biological assessments were not conducted at Limestone Creek.

Figure 1. Limestone Creek at LMSH-1, March 19, 2015.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Limestone Creek is a *Fish and Wildlife (F&W)* stream located in the Dougherty Plain ecoregion (65g) (Figure 1). Based on the 2011 National Land Cover Dataset, landuse within the watershed is primarily cultivated crops and forest (25%). As of April 1, 2016, 30 outfalls were active within the watershed.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Chipola River
Drainage Area (mi^2)		31
Ecoregion[a]		65G
% Landuse[b]		
Open water		<1%
Wetland	Woody	5%
	Emergent herbaceous	<1%
Forest	Deciduous	5%
	Evergreen	18%
	Mixed	2%
Shrub/scrub		14%
Grassland/herbaceous		<1%
Pasture/hay		11%
Cultivated crops		23%
Development	Open space	10%
	Low intensity	7%
	Moderate intensity	2%
	High intensity	<1%
Population/km^2[c]		153
# NPDES Permits[d]	**TOTAL**	30
Construction		20
Industrial Individual		3
Municipal		3
UIC Sites		4

a. Dougherty Plain

b. 2011 National Land Cover Dataset

c. 2010 US Census

d. #NPDES outfalls downloaded from ADEM's NPDES Management System database, April 1, 2016.

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 2. In situ measurements and water samples were collected March through October of 2015 to help determine the water quality. Organics were collected on April 28th; however, all parameters were below detection limits. Median values for several nutrients were higher than background levels for ecoregion 65g. The median concentration of dissolved aluminum was greater than 90% of all verified ecoregional reference reach data collected in the Dougherty Plain ecoregion. Although samples of total dissolved arsenic did exceed human health criteria in Limestone Creek on April 9th, 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 Sate of Alabama. Upon conclusion of the studies, Limestone Creek will be reassessed for arsenic violations. E.coli exceeded *Fish and Wildlife (F&W)* use classification for samples collected in June.

SUMMARY

The water quality samples collected in 2015 at LMSH-1 show that Limestone Creek is not meeting *F&W* use classification due to E.coli exceedances. Monitoring should continue at LMSH-1 to ensure that water quality conditions remain stable, and to further investigate the cause of the higher than expected water quality results.

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	Q	E
Physical								
Temperature (°C)	9	18.9	25.2	20.7	21.8	2.3		
Turbidity (NTU)	9	4.4	23.5	7.6	9.5	5.6		
Total Dissolved Solids (mg/L)	8	55.0	128.0	81.0	83.8	23.8		
Total Suspended Solids (mg/L)	8	2.0	16.0	5.0	6.4	5.2		
Specific Conductance (µmhos/cm)	9	82.9	157.7	106.9 G	116.5	27.4		
Hardness (mg/L)	4	43.7	58.5	50.4 G	50.8	6.4		
Alkalinity (mg/L)	8	29.1	58.9	38.8 M	40.5	9.5		
Monthly Stream Flow (cfs)	6	6.7	30.3	20.0	19.2	10.8		
Measured Stream Flow (cfs)	6	6.7	30.3	20.0	19.2	10.8		
Chemical								
Dissolved Oxygen (mg/L)	9	6.0	8.0	7.8	7.5	0.6		
pH (SU)	9	6.8	7.4	7.1	7.1	0.2		
J Ammonia Nitrogen (mg/L)	8	< 0.010	0.035	0.022 M	0.022	0.010		
Nitrate+Nitrite Nitrogen (mg/L)	8	0.683	2.980	1.145 M	1.478	0.795		
J Total Kjeldahl Nitrogen (mg/L)	8	0.149	0.555	0.432	0.391	0.140		
J Total Nitrogen (mg/L)	8	0.832	3.412	1.582 M	1.869	0.858		
Dis Reactive Phosphorus (mg/L)	8	0.063	0.366	0.108 M	0.168	0.119		
Total Phosphorus (mg/L)	8	0.112	0.396	0.150 M	0.208	0.113		
CBOD-5 (mg/L)	8	< 2.0	< 2.0	1.0	1.0	0.0		
Chlorides (mg/L)	8	5.5	8.6	6.8 M	7.0	1.0		
Atrazine (µg/L)	1	<		<	0.10			
Total Metals								
J Aluminum (mg/L)	4	0.116	0.277	0.220	0.208	0.071		
Iron (mg/L)	4	0.629	1.010	0.958	0.888	0.178		
J Manganese (mg/L)	4	0.036	0.154	0.086	0.090	0.049		
Dissolved Metals								
J Aluminum (mg/L)	4	< 0.106	0.156	0.089 M	0.097	0.052		
Antimony (µg/L)	4	< 0.342	< 0.342	0.171	0.171	0.000		
J Arsenic (µg/L)	4	0.436	0.593 H	0.532	0.524	0.068	3	1
J Cadmium (µg/L)	4	< 0.311	< 0.311	0.156	0.156	0.000		
J Chromium (µg/L)	4	0.439	0.893	0.546	0.606	0.199		
J Copper (µg/L)	4	0.774	1.508	1.014	1.078	0.347		
Iron (mg/L)	4	0.449	0.708	0.581	0.580	0.125		
J Lead (µg/L)	4	< 0.428	< 0.428	0.214	0.214	0.000		
J Manganese (mg/L)	4	0.025	0.096	0.055	0.058	0.030		
J Nickel (µg/L)	4	< 0.460	0.568	0.230	0.314	0.169		
Selenium (µg/L)	4	< 0.395	< 0.395	0.198	0.198	0.000		
Silver (µg/L)	4	< 0.365	< 0.365	0.182	0.182	0.000		
Thallium (µg/L)	4	< 0.514	< 0.514	0.257	0.257	0.000		
J Zinc (µg/L)	4	0.881	4.401	2.864	2.753	1.549		
Biological								
Chlorophyll a (mg/m³)	8	< 0.10	1.34	0.50	0.55	0.36		
J E. coli (MPN/DL)	8	50.4	579.4 H	197.4	240.3	180.2		1

E=# samples with exceedances; G=value higher than median concentration of all verified ecoregional reference reach data collected in the ecoregion 65g; H=*F&W* human health criteria exceeded; J=estimate; M=value >90% of all verified ecoregional reference reach data collected in the ecoregion 65g; N=# samples; Q=# samples with uncertain exceedances.

FOR MORE INFORMATION, CONTACT:
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