

# 2013 Monitoring Summary



## Indian Creek at US Highway 31 (Morgan County) (34.31232/-86.89960)

### BACKGROUND

Indian Creek, from Cotaco Creek to its source, was included in Alabama's 1996 Clean Water Act §303(d) list of impaired waters. Total Maximum Daily Loads (TMDLs) to address impairment caused by excess nitrogen, phosphorus, and carbonaceous biochemical oxygen demand (CBOD) were approved in 2004.

In 2013, the Alabama Department of Environmental Management (ADEM) selected Indian Creek at INDM-1 for biological and water quality monitoring as part of the 2013 Tennessee (TN) Basin Assessment. The objectives of the TN Basin Assessments were to assess the biological integrity of each monitoring site and to estimate overall water quality within the basin.



Figure 1. Indian Creek at INDM-1, May 16, 2013.

### WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Indian Creek is a Fish and Wildlife (*F&W*) stream that drains approximately five square miles in Morgan County. Based on the 2006 National Land Cover Dataset, landuse within the watershed is primarily forest (48%) and pasture/hay, with some areas of shrub/scrub. Developed land occupies approximately eight percent of the watershed. As of September 1, 2012, no NPDES outfalls were active in this watershed (ADEM NPDES Management System).

### REACH CHARACTERISTICS

General observations (Figure 1, Table 2) and a habitat assessment (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. Indian Creek at INDM-1 is a small, mostly shaded stream characterized predominantly by cobble, gravel, and sand substrate. Boulder, silt, and organic matter are also present in this reach. Overall habitat quality and availability is rated as *optimal* for supporting the macroinvertebrate community.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
<b>Basin</b>	Tennessee River	
<b>Drainage Area (mi<sup>2</sup>)</b>	5	
<b>Ecoregion<sup>a</sup></b>	68c	
<b>% Landuse</b>		
Wetland	Woody	<1
Forest	Deciduous	38
	Evergreen	6
	Mixed	4
	Shrub/scrub	8
	Grassland/herbaceous	2
	Pasture/hay	32
	Cultivated crops	3
Development	Open space	5
	Low intensity	2
	Moderate intensity	<1
<b>Population/km<sup>2b</sup></b>	43	

a. Plateau Escarpment

b. 2000 US Census

Table 2. Physical characteristics of Indian Creek at INDM-1, June 13, 2013.

Physical Characteristics		
<b>Width (ft)</b>	10	
<b>Canopy Cover</b>	Mostly Shaded	
<b>Depth (ft)</b>		
	Riffle	0.3
	Run	0.5
<b>% of Reach</b>		
	Riffle	25
	Run	75
<b>% Substrate</b>		
	Boulder	5
	Cobble	30
	Gravel	50
	Sand	10
	Silt	2
	Organic Matter	3

**Table 3. Results of the habitat assessment conducted on Indian Creek at INDM-1, June 13, 2013.**

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	71	Optimal (>70)
Sediment Deposition	70	Sub-optimal (59-70)
Simosity	78	Sub-optimal (65-84)
Bank and Vegetative Stability	66	Sub-optimal (60-74)
Riparian Buffer	68	Marginal (50-69)
Habitat Assessment Score	170	
% Maximum Score	71	Optimal (>70)

## BIOASSESSMENT RESULTS

The benthic macroinvertebrate community was sampled using ADEM's Intensive Multi-habitat Bioassessment methodology (WMB-I). The WMB-I uses measures of taxonomic richness, community composition, and community tolerance to assess the overall health of the macroinvertebrate community. Each metric is scored on a 100 point scale. The final score is the average of all individual metric scores. The final score indicated the biological community at INDM-1 to be in *poor* condition (Table 4), largely due to the low diversity of sensitive insect taxa (i.e., EPT - Ephemeroptera, Plecoptera, Trichoptera) along with a high percentage of tolerant taxa.

**Table 4. Results of the macroinvertebrate assessment conducted in Indian Creek at INDM-1, June 13, 2013.**

Macroinvertebrate Assessment		
	Results	Scores (0-100)
<b>Taxa richness measures</b>		
# EPT taxa	9	22
<b>Taxonomic composition measures</b>		
% Non-insect taxa	16	32
% Dominant taxon	25	62
% EPC taxa	16	29
<b>Functional feeding group measures</b>		
% Predators	10	37
<b>Tolerance measures</b>		
% Taxa as Tolerant	37	35
WMB-I Assessment Score	—	36
WMB-I Assessment Rating		Poor (20-38)

## WATER CHEMISTRY

Results of water chemistry analyses are summarized in Table 5. In situ measurements and water samples were collected in March, May, June, July, and September 2013 to help identify any stressors to the biological community. Total dissolved solids, conductivity, and alkalinity were higher than expected based on reference reach data for streams in ecoregion 68. Median conductivity was almost five-times higher than reference reach data, while median alkalinity was nearly twice the expected concentration. Additionally, the July 25 sample and the summer geometric mean for *E. coli* exceeded the *F&W* human-health criterion.

**Table 5. Summary of water quality data collected March-September, 2013. 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
<b>Physical</b>							
Temperature (°C)	5	12.5	22.3	19.1	18.1	3.8	
Turbidity (NTU)	5	3.2	11.1	6.1	6.6	3.2	
Total Dissolved Solids (mg/L)	4	68.0	170.0	108.0 <sup>M</sup>	113.5	42.2	
Total Suspended Solids (mg/L)	4	< 1.0	109.0	5.2	30.0	52.8	
Specific Conductance (µmhos)	5	138.6	289.1	191.0 <sup>G</sup>	199.8	52.6	
Alkalinity (mg/L)	4	67.4	118.7	77.0 <sup>M</sup>	85.0	23.4	
Stream Flow (cfs)	5	0.8	10.8	2.5	4.2	4.2	
<b>Chemical</b>							
Dissolved Oxygen (mg/L)	5	8.8	10.5	10.0	9.7	0.8	
pH (su)	5	7.0	7.7	7.6	7.4	0.4	
Ammonia Nitrogen (mg/L)	4	< 0.018	0.024	0.008	0.013	0.008	
Nitrate+Nitrite Nitrogen (mg/L)	4	0.453	0.554	0.502	0.503	0.047	
J Total Kjeldahl Nitrogen (mg/L)	4	0.109	0.466	0.346	0.317	0.160	
J Total Nitrogen (mg/L)	4	0.640	0.968	0.836	0.820	0.160	
J Dissolved Reactive Phosphorus (mg/L)	4	0.006	0.010	0.008	0.008	0.002	
Total Phosphorus (mg/L)	4	0.018	0.050	0.020	0.025	0.017	
CBOD-5 (mg/L)	4	< 2.0	< 2.0	1.0	1.0	0.0	
Chlorides (mg/L)	4	2.8	3.4	3.0	3.0	0.4	
Atrazine (µg/L)	1			<	0.07		
<b>Biological</b>							
<i>E. coli</i> (col/100mL)	4	61	866 <sup>H</sup>	121	292	384	2

E=# samples that exceeded criteria; J=estimate; N=# samples; M=value > 90% of ADEM's verified reference reaches collected in ecoregion 68; G=value higher than median of all verified ecoregional reference reach data collected in ecoregion 68; H=*F&W* human health criterion exceeded.

## SUMMARY

The data presented in this report and all other available data will be reviewed to identify the causes and sources of the degraded biological conditions. Bioassessment results show the macroinvertebrate community to be in *poor* condition. Water quality data indicates the stream to have elevated total dissolved solids, conductivity, and alkalinity when compared to data from ADEM's least-impaired reference reaches in ecoregion 68. Also, *E. coli* counts exceeded the *F&W* human health criterion in the summer.

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