

2006 Monitoring Summary



Indian Creek at Hwy 72 bridge in Madison County (34.7502/-86.6976)

BACKGROUND

Since 1998, Indian Creek from AL Hwy 72 upstream to its source has been on Alabama's Clean Water Act (CWA) §303(d) list of impaired waters for not meeting its *Fish and Wildlife (F&W)* water use classification. It was listed for siltation (habitat alteration) and organic enrichment/dissolved oxygen (OE/DO) from non-irrigated crop production, land development, urban runoff/storm sewers, and contaminated sediments.

The Alabama Department of Environmental Management (ADEM) monitored Indian Creek at INDM-250 to assess biological and water quality conditions at the site. Macroinvertebrate and habitat assessments were conducted to verify impairment to aquatic communities. Monthly water chemistry samples were collected to identify the causes of impairment. Results from these data may also be used in the determination of Total Maximum Daily Load needs and priorities.

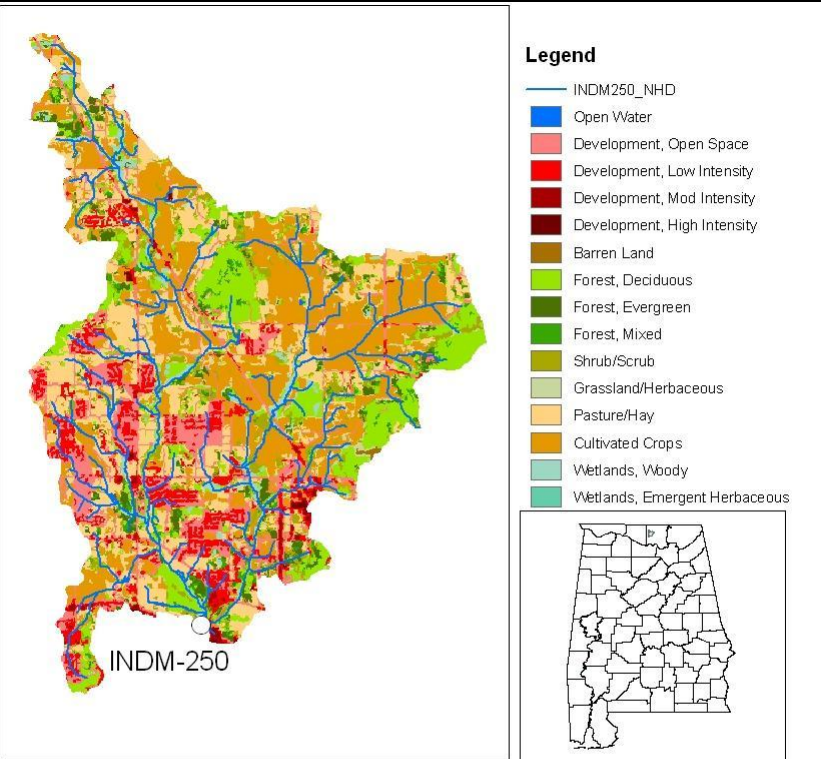


Table 1. Summary of watershed characteristics.

Watershed Characteristics		Tennessee River
Basin		38
Drainage Area (mi ²)		71g
Ecoregion ^a		
% Landuse		
Open water		<1
Wetland	Woody	2
Forest	Deciduous	13
	Evergreen	3
	Mixed	2
Shrub/scrub		7
Grassland/herbaceous		2
Pasture/hay		22
Cultivated crops		26
Development	Open space	12
	Low intensity	8
	Moderate intensity	1
	High intensity	<1
Barren		<1
Population/km ² ^b		132
# NPDES Permits ^c	TOTAL	162
	401 Water Quality Certification	3
	Construction Stormwater	141
	Industrial General	3
	Municipal Individual	5
	Underground Injection Control	10

a. Eastern Highland Rim
b. 2000 US Census
c. #NPDES permits downloaded from ADEM's NPDES Management System database, 18 Sep 2009

Table 2. Summary of physical characteristics at INDM-250, June 7, 2006.

Physical Characteristics		
Width (ft)		35
Canopy cover		Mostly Shaded
Depth (ft)	Riffle	0.4
	Run	0.6
	Pool	1.0
% of Reach	Riffle	10
	Run	80
	Pool	10
% Substrate	Bedrock	63
	Boulder	1
	Cobble	15
	Gravel	10
	Sand	1
	Silt	8
	Organic Matter	2

Figure 1. Sampling location and watershed of Indian Creek at INDM-250.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Land cover within the watershed is illustrated in Figure 1. Indian Creek at INDM-250 is a small watershed located within the Eastern Highland Rim Ecoregion (71g) (Griffith et al. 2001). Twenty percent of the watershed is composed of forest. About 50% of the land cover consisted of cultivated crops, pasture/hay and grasslands. Development accounted for 21% of the land cover. One hundred and sixty-two permits have been issued within the watershed.

REACH CHARACTERISTICS

General observations (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-250 is a mostly-shaded stream reach characterized by bedrock, cobble, and gravel substrates (Fig. 2). Overall habitat quality was rated as *optimal*.

Table 3. Results of a habitat assessment conducted on Indian Creek at INDM-250, June 7, 2006.

Habitat Assessment (% Maximum Score)		Rating
Instream habitat quality	69	Optimal (>65)
Sediment deposition	56	Sub-optimal (53-65)
Sinuosity	73	Sub-optimal (65-84)
Bank and vegetative stability	69	Sub-optimal (60-74)
Riparian buffer	53	Marginal (50-69)
Habitat assessment score	161	
% Maximum score	67	Optimal (>65)



Figure 2. Indian Creek at INDM-250, August 7, 2007.

BIOASSESSMENT RESULTS

Benthic macroinvertebrate communities were 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 an average of the score for each metric. Metric results indicated the macroinvertebrate community to be in *poor* condition (Table 4). Very few pollution-intolerant taxa were collected at the site and the community as a whole was dominated by pollution-tolerant organisms.

WATER CHEMISTRY

In situ measurements and water samples were collected monthly, during March through October of 2006 to help identify any stressors to the biological communities. A summary of these data are presented in Table 5. Stream flow was not detectable after the June sampling event. *In situ* measurements indicated that Indian Creek at INDM-250 was meeting its *F&W* water use classification during seven of eight site visits. Stream pH was slightly elevated in March. The median concentration of nutrients (nitrate+nitrite nitrogen and total nitrogen) and chlorides were higher than expected based on the 90th percentile of data collected at reference reaches located in the Eastern Highland Rim ecoregion. Conductivity was also higher than expected.

SUMMARY

As part of the assessment process, ADEM will review the monitoring information presented in this report, along with all other available data. Results of the 2006 macroinvertebrate assessment indicated the macroinvertebrate community to be in *poor* condition. Development accounted for 21% of land cover within the watershed. Intensive water quality data suggested nutrients (nitrogen) as parameters of concern at the site. However, low flows may also have contributed to these conditions.

Table 4. Results of the macroinvertebrate bioassessment conducted in Indian Creek at INDM-250, June 7, 2006.

Macroinvertebrate Assessment Results			
	Results	Scores	Rating
Taxa richness measures (0-100)			
# Ephemeroptera (mayfly) genera	3	25	Poor (23-46)
# Plecoptera (stonefly) genera	0	0	Very Poor (<16)
# Trichoptera (caddisfly) genera	4	67	Good (67-83)
Taxonomic composition measures			
% Non-insect taxa	18	27	Poor (24.7-49.4)
% Non-insect organisms	4	90	Fair (62.8-93.9)
% Plecoptera	0	0	Very Poor (<6.56)
Tolerance measures			
Beck's community tolerance index	5	18	Very Poor (<20.2)
WMB-I Assessment Score	---	32	Poor (24-48)

Table 5. Summary of water quality data collected March-October, 2006. 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	Median	Avg	SD
Physical						
Temperature (°C)	9	12.6	25.9	20.1	19.5	4.3
Turbidity (NTU)	9	1.4	41.7	3.7 ^M	7.8	12.8
Total Dissolved Solids (mg/L)	8	97.0	169.0	128.0	130.3	21.6
Total Suspended Solids (mg/L)	8	2.0	15.0	5.0	6.1	4.1
Specific Conductance (µmhos)	9	126.0	266.0	222.0 ^M	222.6	43.4
Alkalinity (mg/L)	8	67.6	109.0	102.5	98.0	13.5
Stream Flow (cfs)	6	2.4	37.1	11.2	16.5	15.6
Chemical						
Dissolved Oxygen (mg/L)	9	7.1	9.6	8.4	8.4	0.9
pH (su)	9	7.1	8.6 ^C	8.1 ^M	8.1	0.5
Ammonia Nitrogen (mg/L)	8	< 0.015	0.092	0.008	0.018	0.030
Nitrate+Nitrite Nitrogen (mg/L)	8	1.267	4.520	1.573 ^M	1.870	1.089
Total Kjeldahl Nitrogen (mg/L)	8	< 0.150	0.508	0.220	0.259	0.143
Total Nitrogen (mg/L)	8	1.342	5.028	1.879 ^M	2.130	1.201
Dissolved Reactive Phosphorus (mg/L)	8	0.005	0.018	0.013	0.013	0.004
Total Phosphorus (mg/L)	8	< 0.100	1.000	0.050	0.113	0.158
CBOD-5 (mg/L)	8	< 0.1	1.4	0.5	0.5	0.5
Chlorides (mg/L)	8	4.5	5.7	4.8 ^M	4.9	0.4

N= # samples; C=value exceeds established criteria for *F&W* water use classification; M=value >90% of all verified ecoregional reference reach data collected in the ecoregion 71.

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