

2009 Monitoring Summary



Sinking Creek off of Lauderdale County Road 4 near Woodland Road (34.75320/-87.82250)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Sinking Creek watershed for biological and water quality monitoring as part of the 2009 Assessment of the Tennessee (TN) River Basin. The objectives of the Tennessee Basin Assessments were to assess the biological integrity of each monitoring location and to estimate overall water quality within the TN basin. A habitat and macroinvertebrate assessment were conducted on Sinking Creek at SNKL-7 on June 25, 2009.



Figure 1. Sinking Creek at SNKL-7, facing upstream.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Sinking Creek is a *Fish and Wildlife (F&W)* stream located in the Tennessee River basin. Based on the 2006 National Land Cover Dataset, landuse within the watershed is primarily agriculture (76%) with some forest (8%) and development (<8%). As of September 1, 2012, ADEM's NPDES management system shows a total of seven permitted discharges in this watershed, with two being for stormwater construction.

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. Sinking Creek at SNKL-7 is a moderate-gradient stream characterized primarily by cobble, gravel, and silt (Figure 1). Overall habitat quality was categorized as *sub-optimal*.

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 the average of all individual metric scores. Metric results indicated the macroinvertebrate community to be in *good* condition (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Tennessee River
Drainage Area (mi ²)		44
Ecoregion ^a		71g
% Landuse		
Open water		<1
Wetland	Woody	3
	Emergent herbaceous	<1
Forest	Deciduous	6
	Evergreen	1
	Mixed	1
Shrub/scrub		6
Grassland/herbaceous		1
Pasture/hay		39
Cultivated crops		37
Development	Open space	5
	Low intensity	<1
	Moderate intensity	<1
	High intensity	<1
Barren		<1
Population/km ^{2b}		24
# NPDES Permits ^c	TOTAL	7
	401 Water Quality Certification	1
	Construction Stormwater	2
	Industrial General	1
	Industrial Individual	1
	Underground Injection Control	2

a. Eastern Highland Rim

b. 2000 US Census

c. #NPDES permits downloaded from ADEM's NPDES Management System database, September 1, 2012.

Table 2. Physical characteristics of Sinking Creek at SNKL-7, June 25, 2009.

Physical Characteristics		
Width (ft)		20
Canopy Cover		Mostly Shaded
Depth (ft)	Riffle	0.7
	Run	1.0
	Pool	3.0
% of Reach	Riffle	20
	Run	60
	Pool	20
% Substrate	Clay	1
	Cobble	40
	Mud/Muck	1
	Gravel	22
	Sand	10
	Silt	20
	Organic Matter	6

Table 3. Results of the habitat assessment conducted on Sinking Creek at SNKL-7, June 25, 2009.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	71	Optimal >70
Sediment Deposition	46	Marginal (41-58)
Sinuosity	68	Sub-optimal (65-84)
Bank and Vegetative Stability	50	Marginal (35-59)
Riparian Buffer	75	Sub-optimal (70-89)
Habitat Assessment Score	146	
% Maximum Score	61	Sub-optimal (59-70)

Table 4. Results of macroinvertebrate bioassessment conducted in Sinking Creek at SNKL-7, June 25, 2009.

Macroinvertebrate Assessment			
	Results	Scores	
		(0-100)	
Taxa richness and diversity measures			
	# EPT taxa	15	48
	Shannon Diversity	4.00	60
Taxonomic composition measures			
	% EPT minus Baetidae and Hydropsychidae	32	70
	% Non-insect taxa	16	34
Functional feeding group			
	% Predator Individuals	5	13
Community tolerance			
	% Tolerant taxa	30	54
	WMB-I Assessment Score	---	47
	WMB-I Assessment Rating		Good (44-72)

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. In situ measurements and water samples were collected monthly, semi-monthly (metals), or quarterly (pesticides, atrazine, and semi-volatile organics) during March through October of 2009 to help identify any stressors to the biological communities. Dissolved copper and arsenic exceeded criteria applicable to Sinking Creek's *F&W* use classification during one of four sampling events. Median total dissolved solids, specific conductance, hardness, alkalinity, nutrients (nitrate+nitrite nitrogen, total nitrogen, dissolved reactive phosphorus, total phosphorus), chlorides, and total (aluminum, iron, manganese), and dissolved (iron and zinc) metals were elevated as compared to reference reach data collected in ecoregion 71g.

SUMMARY

Results for the 2009 bioassessment indicated the macroinvertebrate community to be in *good* condition. However, intensive water chemistry results indicated nutrient enrichment, metals and conductivity to be issues of concern within the stream reach.

Table 5. Summary of water quality data collected March-October, 2009. Minimum (Min) and maximum (Max) values calculated using minimum detection limits (MDL). Median (Med), 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
Physical							
Temperature (°C)	9	15.9	20.8	18.8	18.4	1.5	
Turbidity (NTU)	9	1.0	32.7	8.0	9.0	9.5	
^J Total Dissolved Solids (mg/L)	8	126.0	202.0	156.0 ^M	156.8	26.8	
^J Total Suspended Solids (mg/L)	8	1.0	33.0	6.5	9.9	10.3	
Specific Conductance (µmhos)	9	123.2	310.1	264.9 ^G	252.2	59.6	
Hardness (mg/L)	4	53.1	145.0	106.7 ^G	102.9	39.3	
Alkalinity (mg/L)	8	52.6	150.0	117.0 ^M	116.2	31.6	
Stream Flow (cfs)	7	5.6	28.2	20.8	19.4	8.1	
Chemical							
Dissolved Oxygen (mg/L)	9	6.3	8.3	7.1	7.0	0.6	
pH (su)	9	7.0	7.2	7.1	7.1	0.1	
^{BJ} Ammonia Nitrogen (mg/L)	4	< 0.006	< 0.014	0.003	0.004	0.002	
^{BJ} Nitrate+Nitrite Nitrogen (mg/L)	4	0.463	2.078	1.688 ^M	1.479	0.744	
^{BJ} Total Kjeldahl Nitrogen (mg/L)	4	< 0.089	0.842	0.418	0.430	0.326	
^{BJ} Total Nitrogen (mg/L)	4	1.305	2.390	1.972 ^M	1.910	0.465	
^{BJ} Dissolved Reactive Phosphorus (mg/L)	3	0.022	0.064	0.033 ^M	0.040	0.022	
^{BJ} Total Phosphorus (mg/L)	4	0.030	0.158	0.067 ^M	0.081	0.058	
CBOD-5 (mg/L)	8	< 1.0	< 2.0	0.5	0.7	0.3	
^J Chlorides (mg/L)	8	2.3	4.2	3.2 ^M	3.2	0.6	
Atrazine (µg/L)	2	0.15	0.88	0.52	0.52	0.52	
Total Metals							
^J Aluminum (mg/L)	4	0.044	0.883	0.548 ^M	0.506	0.373	
^J Iron (mg/L)	4	0.179	1.490	0.520 ^M	0.677	0.571	
^J Manganese (mg/L)	4	0.019	0.184	0.029 ^M	0.065	0.079	
Dissolved Metals							
^J Aluminum (mg/L)	4	< 0.033	0.098	0.030	0.044	0.037	
Antimony (µg/L)	4	< 0.7	< 6.0	3.0	2.3	1.3	
^J Arsenic (µg/L)	4	< 0.4	1.4 ^H	0.2	0.5	0.6	1
Cadmium (mg/L)	4	< 0.002	< 0.003	0.001	0.001	0.000	
Chromium (mg/L)	4	< 0.007	< 0.013	0.004	0.004	0.002	
^J Copper (mg/L)	4	0.023 ^S	< 0.200	0.100	0.081	0.038	1
^J Iron (mg/L)	4	< 0.026	0.187	0.091 ^M	0.096	0.079	
Lead (µg/L)	4	< 1.0	< 1.5	0.8	0.7	0.1	
^J Manganese (mg/L)	4	0.013	0.068	0.015	0.028	0.027	
^{BJ} Mercury (µg/L)	2	< 0.1	< 0.1	0.0	0.0	0.0	
Nickel (mg/L)	4	< 0.008	< 0.019	0.004	0.005	0.003	
Selenium (µg/L)	4	< 0.4	< 0.4	0.2	0.2	0.0	
Silver (mg/L)	4	< 0.001	< 0.002	0.000	0.001	0.000	
Thallium (µg/L)	4	< 0.4	< 0.4	0.2	0.2	0.0	
Zinc (mg/L)	4	< 0.030	< 0.060	0.030 ^M	0.026	0.008	
Biological							
Chlorophyll a (µg/L)	8	0.27	1.34	0.66	0.76	0.37	
^J Fecal Coliform (col/100 mL)	8	24	600	81	208	247	
E. coli (col/100mL)	1				248		

J=estimate; B=one or more samples excluded from calculations because they did not meet laboratory QC requirements; N=# samples; E=# of samples that exceed criterion; S=*F&W* hardness-adjusted aquatic life use criterion exceeded; H=*F&W* human health criterion exceeded; G=value greater than median concentration of all verified reference data collected in ecoregion 71g; M=value > 90% of all verified ecoregional reference reach data collected in the ecoregion 71g.

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