Alabama Department of Environmental Management

Ecological Reference Reach

Rivers and Streams Monitoring Program

2007 Monitoring Summary

Fair

Sipsey Fork at Winston County Road 60 (Cranal Road) (34.28558/-87.39905)

BACKGROUND

Sipsey Fork is one of the streams the Alabama Department of Environmental Management (ADEM) monitors as a "best attainable condition" reference watershed for comparison with larger streams throughout the Southwestern Appalachians ecoregion (68).

Additionally, Sipsey Fork was selected for biological and water quality monitoring as part of the Black Warrior and Cahaba (BWC) River Basins Assessment. The objectives of the BWC Basin Assessments were to assess the biological integrity of each monitoring site and to estimate overall water quality within the BWC basin group.

Figure 1. Sipsey Fork at SF-1, November 15, 2010.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Sipsey Fork is a *Fish & Wildlife (F&W)* stream in William B. Bankhead National Forest in Winston County. Sipsey Fork at SF-1 is designated as an Outstanding National Resource Water. According to the 2000 National Land Cover Dataset, land- use within the watershed is approximately 95% forested. As of February 23, 2011, ADEM's NPDES Management System showed two NPDES permitted discharges 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. Sipsey Fork at SF-1 is a high-gradient, riffle-run stream characterized by sand and cobble substrates (Figure 1). Overall habitat quality was rated as *optimal* for supporting macroinvertebrate communities.

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. The final score indicated the biological community in Sipsey Fork at SF-1 to be in *fair* condition (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Black Warrior River
Drainage Area (mi^2)		89
Ecoregion[a]		68e
% Landuse		
Open water		<1
Wetland	Woody	<1
	Emergent herbaceous	<1
Forest	Deciduous	58
	Evergreen	20
	Mixed	17
Shrub/scrub		1
Grassland/herbaceous		<1
Pasture/hay		1
Cultivated crops		<1
Development	Open space	1
	Low intensity	<1
	Moderate intensity	<1
Barren		<1
Population/km^2[b]		3
# NPDES Permits[c]	**TOTAL**	2
Construction Stormwater		2

a.Dissected Plateau
b.2000 US Census
c.#NPDES permits downloaded from ADEM's NPDES Management System database, February 23, 2011.

Table 2. Physical characteristics of Sipsey Fork at SF-1, June 6, 2007.

Physical Characteristics		
Width (ft)		50
Canopy cover		Estimate 50/50
Depth (ft)		
	Riffle	0.5
	Run	1.5
	Pool	3
% of Reach		
	Riffle	25
	Run	50
	Pool	25
% Substrate		
	Boulder	10
	Cobble	25
	Gravel	15
	Sand	40
	Silt	5
	Organic Matter	5

Table 3. Results of the habitat assessment conducted in Sipsey Fork at SF-1, June 6, 2007.

Habitat Assessment	% Maximum Score	Rating
Instream Habitat Quality	68	Sub-optimal (59-70)
Sediment Deposition	69	Sub-optimal (59-70)
Sinuosity	83	Sub-optimal (65-84)
Bank and Vegetative Stability	75	Optimal (> 74)
Riparian Buffer	90	Optimal (> 89)
Habitat Assessment Score	**181**	
% Maximum score	**75**	**Optimal (> 70)**

Table 4. Results of macroinvertebrate assessment conducted in Sipsey Fork at SF-1, June 6, 2007.

Macroinvertebrate Assessment		
	Results	**Scores**
Taxa richness measures		**(0-100)**
# EPT taxa	20	70
Taxonomic composition measures		
% Non-insect taxa	8	72
% Dominant taxon	26	58
% EPC taxa	30	57
Functional feeding group measures		
% Predators	8	29
Tolerance measures		
% Taxa as Tolerant	27	62
WMB-I Assessment Score	**---**	**58**
WMB-I Assessment Rating		**Fair (39-58)**

WATER CHEMISTRY

Results of water chemistry samples are presented in Table 5. In situ measurements and water samples were collected monthly, semi-monthly (metals), or quarterly (pesticides, herbicides (atrazine), and semi-volatile organics) during March through October of 2007 to help identify any stressors to the biological communities. Concentrations of dissolved copper, lead, and mercury exceeded criteria applicable to Sipsey Fork's *F&W* use classification. Median values of specific conductance, hardness, chlorides, total manganese, and dissolved manganese were higher than expected when compared to verified data of other reference reaches in ecoregion 68e. All other parameters were within expected limits.

SUMMARY

Landuse, road density, and population density categorize Sipsey Fork among the least-disturbed watersheds in the BWC basin group. However, despite *optimal* habitat conditions, results of the macroinvertebrate assessment indicated the macroinvertebrate community to be in *fair* condition. It is possible that the elevated metals, specific conductance, hardness, and chloride concentrations are affecting the biological communities in the reach. Monitoring should continue at SF-1 to ensure that water quality continues to meet standards necessary for an ecological reference reach.

FOR MORE INFORMATION, CONTACT:
Rebekah Moore, ADEM Aquatic Assessment Unit
1350 Coliseum Boulevard Montgomery, AL 36110
(334) 260-2759 rcmoore@adem.state.al.us

Table 5. Summary of water quality data collected March-October, 2007. 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
Physical							
Temperature (°C)	9	17.7	26.5	21.1	21.8	3.2	
Turbidity (NTU)	9	1.8	4.5	2.7	2.8	1.0	
Total Dissolved Solids (mg/L)	8	35.0	129.0	58.0	64.8	29.6	
Total Suspended Solids (mg/L)	8	< 1.0	3.0	0.8	1.1	0.9	
Specific Conductance (µmhos)	9	46.0	100.0	71.0 G	71.7	19.9	
Hardness (mg/L)	5	15.8	46.4	23.7 G	27.5	11.8	
Alkalinity (mg/L)	8	7.9	43.6	27.4	28.2	12.8	
Stream Flow (cfs)	7	3.6	66.8	12.0	21.2	22.8	
Chemical							
Dissolved Oxygen (mg/L)	9	7.2	9.5	7.7	8.1	0.8	
pH (su)	9	7.1	7.9	7.6	7.6	0.3	
Ammonia Nitrogen (mg/L)	8	< 0.015	0.016	0.008	0.010	0.004	
Nitrate+Nitrite Nitrogen (mg/L)	8	< 0.003	0.397	0.052	0.100	0.130	
J Total Kjeldahl Nitrogen (mg/L)	8	< 0.150	0.568	0.192	0.248	0.194	
J Total Nitrogen (mg/L)	8	< 0.084	0.965	0.316	0.349	0.287	
Dissolved Reactive Phosphorus (mg/L)	8	< 0.004	< 0.005	0.002	0.002	0.000	
J Total Phosphorus (mg/L)	8	< 0.006	< 1.000	0.025	0.080	0.170	
CBOD-5 (mg/L)	8	< 0.1	< 1.0	0.5	0.5	0.3	
COD (mg/L)	3	< 2.0	4.2	4.0	3.1	1.8	
TOC (mg/L)	3	1.8	2.2	1.8	2.0	0.2	
Chlorides (mg/L)	8	0.6	1.6	1.1 M	1.0	0.3	
Atrazine (µg/L)	2	< 0.05	0.11	0.07	0.07	0.06	
Total Metals							
Aluminum (mg/L)	5	< 0.060	0.217	0.030	0.067	0.084	
Iron (mg/L)	5	0.157	0.734	0.530	0.523	0.224	
Manganese (mg/L)	5	< 0.050	0.092	0.072 M	0.066	0.025	
Dissolved Metals							
Aluminum (mg/L)	5	< 0.050	0.374	0.025	0.095	0.156	
Antimony (µg/L)	5	< 10.0	< 10.0	5.0	5.0	0.0	
Arsenic (µg/L)	5	< 0.3	< 0.3	0.2	0.2	0.0	
Cadmium (mg/L)	5	< 0.002	< 0.015	0.001	0.004	0.004	
Chromium (mg/L)	5	< 0.002	< 0.050	0.001	0.011	0.013	
Copper (mg/L)	5	< 0.007	< 0.050 S	0.025	0.022	0.016	2
Iron (mg/L)	5	0.078	0.494	0.369	0.337	0.154	
Lead (µg/L)	5	< 0.5	1.1 S	0.2	0.5	0.4	2
Manganese (mg/L)	5	< 0.020	0.184	0.060 M	0.075	0.065	
Mercury (µg/L)	5	< 0.0	0.1 AH	0.0	0.0	0.0	1
Nickel (mg/L)	5	< 0.002	< 0.050	0.001	0.011	0.013	
Selenium (µg/L)	5	< 0.3	< 0.3	0.2	0.2	0.0	
Silver (mg/L)	5	< 0.005	< 0.050	0.002	0.007	0.010	
Thallium (µg/L)	5	< 0.7	< 0.7	0.4	0.4	0.0	
Zinc (mg/L)	5	< 0.017	< 0.050	0.008	0.015	0.009	
Biological							
J Chlorophyll a (ug/L)	8	< 1.00	< 1.00	0.50	0.50	0.00	
J Fecal Coliform (col/100 mL)	8	8	250	19	67	96	

A=*F&W* aquatic life use criterion exceeded; E=# samples that exceed criterion; G=value greater than median concentration of all verified reference data collected in ecoregion 68e; H=human health criterion exceeded; J=estimate; M=value > 90th percentile of all verified reference data collected in ecoregion 68e. N=number of samples; S= *F&W* hardness adjusted aquatic life use criteria exceeded;