

2011 Monitoring Summary



Ambient Monitoring Site

Fish River at AL Highway 104 in Baldwin County (30.5458/-87.7983)

BACKGROUND

Since 1996, Fish River has been on Alabama's Clean Water Act (CWA) §303(d) list of impaired water bodies for not meeting its *Swimming/Fish and Wildlife (S/F&W)* water use classifications. It is listed for pathogens from pasture grazing and mercury from atmospheric deposition.

Fish River at FI-1 is one of 103 sites monitored in 2011 by the Alabama Department of Environmental Management (ADEM) to identify long-term trends in water quality and to provide data for the development of Total Maximum Daily Loads (TMDLs) and water quality criteria.

The site was selected for biological and water quality monitoring as part of the 2011 Assessment of the Escatawpa, Mobile, and Tombigbee (EMT) River Basins. The objectives of this project were to assess the biological integrity of each monitoring site and to estimate overall water quality within the EMT basin group.

Fish River at FI-1 was also selected as a site for the 2011 Weeks Bay Nutrient Sources, Fate, Transport, and Effects Study. The final report of Weeks Bay study is available at <http://www.adem.alabama.gov/programs/water/wqsurvey/>



Figure 1. Upstream view of Fish River at FI-1, April 18, 2011.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Fish River at FI-1 is located within the Southern Pine Plains and Hills (65f) ecoregion. Based on the 2006 National Land Cover Dataset, 42% of the watershed is comprised of forest and wooded wetlands and 31% of the land cover is composed of cultivated crops and pasture. Development accounted for 12% of land cover. As of September 1, 2012, the ADEM has issued 349 permits.

REACH CHARACTERISTICS

General observations (Table 2) and a habitat assessment (Table 3) were completed during the macroinvertebrate assessment to give an indication of the physical condition of the site and the quality and availability of habitat. Fish River at FI-1 is a tannic, low gradient, sand-bottomed stream typical of this ecoregion. Overall habitat quality was categorized as *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 metric scores. Metric results indicated the macroinvertebrate community in Fish River at FI-1 to be in *good* condition (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		Mobile River
Basin		Mobile River
Drainage Area (mi²)		56
Ecoregion^a		65f
% Landuse		
Open water		<1
Wetland	Woody	13
	Emergent herbaceous	<1
Forest	Deciduous	<1
	Evergreen	28
	Mixed	1
Shrub/scrub		6
Grassland/herbaceous		8
Pasture/hay		11
Cultivated crops		20
Development	Open space	8
	Low intensity	3
	Moderate intensity	1
	High intensity	<1
Barren		<1
Population/km^{2b}		45
# NPDES Permits^c	TOTAL	349
	401 Water Quality Certification	1
	Construction Stormwater	275
	Mining	14
	Industrial General	1
	Industrial Individual	2
	Municipal Individual	52
	Underground Injection Control	4

a. Southern Pine Plains & Hills

b. 2000 US Census

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

Table 2. Physical characteristics of Fish River at FI-1, May 3, 2011.

Physical Characteristics	
Canopy Cover	Shaded
Width (ft)	20
Depth (ft)	
	Run
	Pool
% of Reach	
	Run
	Pool
% Substrate	
	Sand
	Silt
	Organic Matter

Table 3. Results of the habitat assessment conducted on Fish River at FI-1, May 3, 2011.

Habitat Assessment	%Maximum Score	Rating
GP		
Instream Habitat Quality	71	Optimal >65
Sediment Deposition	71	Optimal >65
Sinuosity	40	Poor <45
Bank and Vegetative Stability	64	Sub-optimal (60-74)
Riparian Buffer	93	Optimal >89
Habitat Assessment Score	159	
% Maximum Score	72	Optimal >65

Table 4. Results of the macroinvertebrate bioassessment conducted in Fish River at FI-1, May 3, 2011.

Macroinvertebrate Assessment		
	Results	Scores (0-100)
Taxa richness and diversity measures		
% EPC taxa	34	65
% Trichoptera & Chironomidae Taxa	43	37
Taxonomic composition measures		
% EP Individuals	19	37
Functional feeding group		
% Collector-Filterer Individuals	22	65
Community tolerance		
% Nutrient Tolerant individuals	32	57
WMB-I Assessment Score	---	52
WMB-I Assessment Rating		Good (46-73)

WATER CHEMISTRY

Results of water chemistry are presented in Table 5. In situ measurements and water samples were collected monthly and metals collected three times during January through November of 2011 to help identify any stressors to the biological communities. No pesticides, herbicides (atrazine), or semi-volatile organics samples were collected. Dissolved oxygen concentrations ranged from 7.7-9.6 mg/L. Stream pH values were below the 6.0 criteria in thirteen of the thirty-two samples collected; however, a slightly acidic pH is not unusual in this stream type. An E-coli sample collected on October 12, 2011 exceeded *Swimming* criteria. Median specific conductance and hardness were higher than expected for the ecoregion. Median nutrient concentrations (total nitrogen, nitrate-nitrite, total phosphorous and dissolved reactive phosphorous) were higher than expected based on the 90th percentile of reference reaches in this ecoregion.

SUMMARY

Bioassessment results indicated the macroinvertebrate community to be in *good* condition. Overall habitat quality was categorized as *optimal*. Elevated nutrient, chlorides, conductivity and hardness levels may be potential causes for deterioration of biological communities and the higher than expected nutrient concentrations suggest nutrient enrichment. Thirteen pH exceedances were noted where the result was below the 6.0 *F&W* use classification criteria; however, the neutral to slightly acidic pH is typical of streams in this ecoregion.

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Table 5. Summary of water quality data collected January-November 2011. 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)	32	14.1	24.1	21.8	20.7	2.6	
Turbidity (NTU)	26	1.0	15.0	2.7	3.4	2.6	
Total Dissolved Solids (mg/L)	11	37.0	78.0	51.0	51.2	10.7	
Total Suspended Solids (mg/L)	11 <	5.0	10.0	2.5	4.0	2.4	
Specific Conductance (µmhos)	11	48.0	63.4	60.0 ^G	58.9	4.6	
Hardness (mg/L)	3	15.0	19.3	15.0 ^G	16.4	2.5	
^J Alkalinity (mg/L)	11 <	4.0	5.0	4.0	3.2	1.2	
Stream Flow (cfs)	33	35.0	107.0	45.0	46.7	13.6	
Chemical							
Dissolved Oxygen (mg/L)	32	7.7	9.6	8.1	8.2	0.5	
pH (su)	32	5.4 ^C	7.4	6.0	6.1	0.5	13
^J Ammonia Nitrogen (mg/L)	11 <	0.014	0.100	0.007	0.016	0.028	
^J Nitrate+Nitrite Nitrogen (mg/L)	11	1.090	2.660	2.000 ^M	2.034	0.444	
^J Total Kjeldahl Nitrogen (mg/L)	11 <	0.070	0.390	0.200	0.194	0.127	
^J Total Nitrogen (mg/L)	11 <	1.480	2.860	2.220 ^M	2.229	0.417	
Dissolved Reactive Phosphorus (mg/L)	11	0.018	0.200	0.097 ^M	0.097	0.051	
^J Total Phosphorus (mg/L)	11	0.045	0.210	0.120 ^M	0.121	0.049	
^J CBOD-5 (mg/L)	11 <	1.0	1.1	0.5	0.6	0.2	
^J TOC (mg/L)	10	0.7	2.0	1.3	1.3	0.4	
Chlorides (mg/L)	11 <	0.2	7.9	7.5 ^M	6.9	2.3	
Total Metals							
^J Aluminum (mg/L)	3	0.147	0.342	0.150	0.213	0.112	
Iron (mg/L)	3	0.251	0.340	0.282	0.291	0.045	
^J Manganese (mg/L)	3	0.023	0.034	0.023	0.027	0.006	
Dissolved Metals							
^J Aluminum (mg/L)	3	0.086	0.112	0.104	0.101	0.013	
Antimony (µg/L)	3 <	1.9 <	2.3	1.2	1.1	0.1	
Arsenic (µg/L)	3 <	1.4 <	2.8	1.0	1.0	0.4	
Cadmium (mg/L)	3 <	0.00002 <	0.0001 <	0.0001 <	0.0001	0.000	
Chromium (mg/L)	3 <	0.006 <	0.006	0.003	0.003	0.000	
Copper (mg/L)	3 <	0.005 <	0.005	0.002	0.002	0.000	
^J Iron (mg/L)	3	0.105	0.134	0.125	0.121	0.015	
Lead (µg/L)	3 <	0.8 <	0.9	0.4	0.4	0.0	
^J Manganese (mg/L)	3	0.006	0.020	0.018	0.015	0.008	
^J Mercury (µg/L)	2 <	0.072 <	0.105	0.044	0.044	0.012	
Nickel (mg/L)	3 <	0.007 <	0.007	0.004	0.004	0.000	
Selenium (µg/L)	3 <	0.8 <	1.3	0.4	0.5	0.1	
Silver (mg/L)	3 <	0.00002 <	0.0002 <	0.0002 <	0.0001	0.000	
Thallium (µg/L)	3 <	1.1 <	1.2	0.6	0.6	0.0	
^J Zinc (mg/L)	3 <	0.032 <	0.032	0.016	0.016	0.000	
Biological							
^J Chlorophyll a (µg/L)	11 <	1.00 <	1.00	0.50	0.50	0.00	
^J E. coli (col/100mL)	17	4	270	110	106	76	1

E= # samples exceeding criteria; J=estimate; N= # samples; M=value>90% of all verified ecoregional reference reach data collected in sub-ecoregion 65f; C=value exceeds established criteria for *F&W* water use classification; G=value greater than median concentration of all verified reference data collected in ecoregion 65f.