

2005 Monitoring Summary



Big Swamp Creek at Alabama Highway 21, Lowndes County (32.16379/-86.60194)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Big Swamp Creek watershed for biological and water quality monitoring as part of the 2005 Assessment of the Alabama, Coosa, and Tallapoosa (ACT) River Basins. The objectives of the ACT Basin Assessments were to assess the biological integrity of each monitoring site and to estimate overall water quality within the ACT basin group. A habitat and macroinvertebrate assessment were conducted on Big Swamp Creek at BSWL-1 on April 27, 2005.

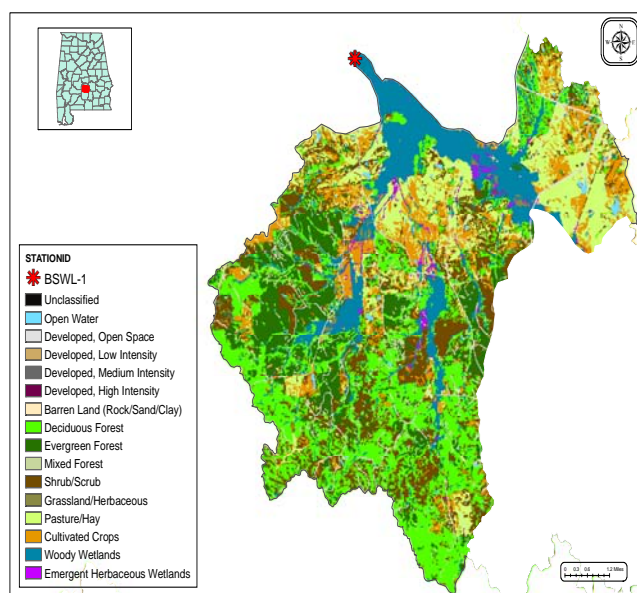


Figure 1. Sampling location and landuse within the Big Swamp Creek watershed at BSWL-1.

WATERSHED CHARACTERISTICS

Big Swamp Creek at BSWL-1 is a *Fish & Wildlife (F&W)* stream located the Blackland Prairie ecoregion in Lowndes County (Figure 1). Based on the 2006 National Land Cover Dataset, land use within the watershed is primarily forest (45%) and woody wetland with some shrub/scrub, and pasture areas (Table 1, Figure 1). As of February 2011, ADEM's NPDES Management System database shows a total of seven 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. Big Swamp Creek at BSWL-1 is a deep, braided, low-gradient stream reach characterized by clay substrates. Overall habitat quality was rated as *sub-optimal* for supporting macroinvertebrate communities.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin	Alabama River	
Drainage Area (mi²)	107	
Ecoregion^a	65a	
% Landuse		
Open water		<1
Wetland	Woody	13
	Emergent herbaceous	1
Forest	Deciduous	27
	Evergreen	15
	Mixed	3
	Shrub/scrub	18
	Grassland/herbaceous	<1
	Pasture/hay	10
	Cultivated crops	9
Development	Open space	3
	Low intensity	<1
	Moderate intensity	<1
Barren		<1
Population/km^{2b}	14	
# NPDES Permits^c	TOTAL	7
	Construction Stormwater	6
	Industrial General	1

a.Blackland Prairie

b.2000 US Census

c.#NPDES permits downloaded from ADEM's NPDES Management System database, February 23, 2011

Table 2. Physical characteristics of Big Swamp Creek at BSWL-1, May 27, 2005.

Physical Characteristics	
Canopy Cover	Mostly Shaded
Width (ft)	35.0
Depth (ft)	
	Pool 3.5
% of Reach	
	Pool 100
% Substrate	
	Clay 94
	Organic Matter 6

Table 3. Results of the habitat assessment conducted on Big Swamp Creek at BSWL-1, May 27, 2005.

Habitat Assessment	%Maximum	Rating
Instream Habitat Quality	34	Poor <40
Sediment Deposition	73	Optimal >65
Sinuosity	33	Poor <45
Bank and Vegetative Stability	43	Marginal (35-59)
Riparian Buffer	88	Sub-optimal (70-89)
Habitat Assessment Score	123	
% Maximum Score	56	Sub-optimal (53-65)

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Table 4. Results of macroinvertebrate assessment conducted in Big Swamp Creek at BSWL-1, 5/27/2005.

Macroinvertebrate Assessment				
	Result	Score	Rating	
Taxa Richness Measures				
# EPT genera	10	40	Fair (38 - 56)	
Taxonomic composition				
% Non-Insect Taxa	11	70	Fair (61.9 - 92.7)	
% Plecoptera	1	0	Very Poor (<= 1.85)	
% Dominant Taxon	27	57	Fair (47.1 - 70.5)	
Functional composition measures				
% Predators	13	44	Fair (30.2 - 45.2)	
Tolerance measures				
Becks community tolerance	3	14	Poor (10.6 - 21.2)	
% Nutrient tolerant organisms	34	60	Fair (50.9 - 76.2)	
WMB-I Assessment Score	---	41	Fair (38 - 56)	

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. Bioassessment results indicated the macroinvertebrate community in Big Swamp Creek at BSWL-1 to be in *fair* condition. (Table 4).

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. In-situ measurements and water samples were collected during March through October of 2005 to help identify any stressors to the biological communities. *In situ* parameters, measured during each site visit, indicated that Big Swamp Creek at BSWL-1 was not meeting its *F&W* water use classification criteria for dissolved oxygen, possibly due to low flow conditions. Nutrients were also elevated, with median dissolved reactive phosphorous and total phosphorous values greater than the 90th percentile of all ecoregional reference data collected in ecoregions 65a and 65b. Metals sample results were typical for this stream type. However, median total manganese was higher than expected for the ecoregion. Median chlorophyll *a*, conductivity, hardness, CBOD₅ and alkalinity concentrations were slightly elevated in comparison to least-impaired ecoregional reference reaches within the Blackland Prairie. Organic samples, along with Atrazine, were collected in June, with all results less than minimum detection limit (MDL).

SUMMARY

Big Swamp Creek at BSWL-1 was selected for biological and water quality monitoring as part of the 2005 Assessment of the ACT River Basins. The condition of the macroinvertebrate community residing in Big Swamp Creek at BSWL-1 was rated as *fair*.

Median dissolved reactive phosphorous, total phosphorous and CBOD₅ were elevated above the 90th percentile of all ecoregional reference data collected in ecoregions 65a & 65b. Median chlorophyll *a*, conductivity, hardness, and alkalinity concentrations were slightly elevated in comparison to least-impaired ecoregional reference reaches within the Blackland Prairie. Dissolved oxygen was measured below established *F&W* water use criteria during two of six sampling visits, possibly due to low flow conditions.

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Table 5. Summary of water quality data collected March-October, 2005. Minimum (Min) and maximum (Max) values calculated using minimum detection limits (MDL) when results were less than this values. 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)	6	17.0	27.0	25.4	23.8	4.1	
Turbidity (NTU)	6	10.1	73.0	21.1	31.5	25.9	
Total Dissolved Solids (mg/L)	5	144.0	239.0	207 ^M	204.6	36.9	
Total Suspended Solids (mg/L)	5	9.0	58.0	40.0	35.6	23.7	
Specific Conductance (µmhos)	6	206.4	375.9	294.2 ^G	294.2	72.6	
Hardness (mg/L)	2	91.6	151.0	121.3 ^G	121.3	42.0	
Alkalinity (mg/L)	5	62.9	163.6	132.4 ^M	123.5	41.4	
Stream Flow (cfs)	5	0.7	29.2	13.9	14.2	10.5	
Chemical							
Dissolved Oxygen (mg/L)	6	3.6 ^C	7.1	5.6	5.3	1.2	2
pH (su)	6	7.0	8.0	7.4	7.4	0.3	
Ammonia Nitrogen (mg/L)	5	0.018	0.056	0.026	0.033	0.017	
Nitrate+Nitrite Nitrogen (mg/L)	5	0.034	1.489	0.064	0.343	0.641	
Total Kjeldahl Nitrogen (mg/L)	5	0.495	0.992	0.645	0.692	0.190	
Total Nitrogen (mg/L)	5	0.557	2.481	0.709	1.035	0.812	
Dissolved Reactive Phosphorus (mg/L)	5	0.024	0.073	0.033 ^M	0.040	0.020	
Total Phosphorus (mg/L)	5	0.093	1.185	0.129 ^M	0.332	0.477	
CBOD-5 (mg/L)	5	1.2	5.5	3.8 ^M	3.6	1.8	
Chlorides (mg/L)	5	5.8	8.0	7.2	7.1	0.9	
Atrazine (µg/L)	1				<0.05		
Total Metals							
Aluminum (mg/L)	2	<0.015	0.670	0.339	0.339	0.468	
Iron (mg/L)	2	0.238	0.949	0.594	0.594	0.503	
Manganese (mg/L)	2	<0.005	2.000	1.001 ^M	1.001	1.412	
Dissolved Metals							
Aluminum (mg/L)	2	<0.015	0.108	0.058	0.058	0.071	
Antimony (µg/L)	2	<2.0	<2.0	1.0	1.0	0.0	
Arsenic (µg/L)	2	<10.0	<10.0	5.0	5.0	0.0	
Cadmium (µg/L)	2	<5.0	<5.0	2.500	2.500	0.000	
Chromium (µg/L)	2	<4.0	<4.0	2.000	2.000	0.000	
Copper (mg/L)	2	<0.005	<0.005	0.002	0.002	0.000	
Iron (mg/L)	2	0.042	0.054	0.048	0.048	0.008	
Lead (µg/L)	2	<2.0	<2.0	1.0	1.0	0.0	
Manganese (mg/L)	2	<0.005	0.030	0.016	0.016	0.019	
Mercury (µg/L)	2	<0.300	<0.300	0.150	0.150	0.000	
Nickel (mg/L)	2	<0.006	<0.006	0.003	0.003	0.000	
Selenium (µg/L)	2	<10.0	<10.0	5.0	5.0	0.0	
Silver (µg/L)	2	<3.0	<3.0	1.500	1.500	0.000	
Thallium (µg/L)	2	<1.0	<1.0	0.5	0.5	0.0	
Zinc (mg/L)	2	<0.006	<0.006	0.003	0.003	0.000	
Biological							
Chlorophyll a (ug/L)	5	1.07	11.75	9.61 ^M	8.12	4.24	
Fecal Coliform (col/100 mL)	5	5	490	70	167	198	

C= value exceeds established criteria for F&W water use classification; G=value higher than median concentration of all verified ecoregional reference reach data collected in the ecoregion 65a/b; J=Reported value is an estimate; N=# samples; M=value > 90% of all ecoregional reference reach data collected in the 65a/b ecoregion.