Bogue Chitto Creek at Perry Co Rd 38 near Eagles Grove Church (32.55548/-87.32595)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Bogue Chitto 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
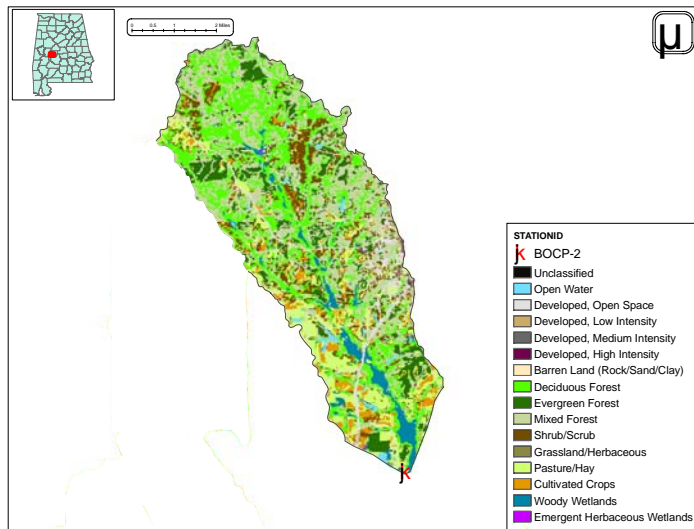

Figure 1. Sampling location and landuse within the Bogue Chitto Creek watershed at BOCP-2.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Bogue Chitto Creek is a *Fish & Wildlife (F&W)* stream located near the city of Marion (Fig. 1). At BOCP-2, the stream drains approximately 32 square miles of the headwaters of the Upper Bogue Chitto Creek watershed which was given a first priority watershed rating for nonpoint source impairment potential by the local Soil and Water Conservation District (SWCD) in 1998 *[link to citation?]*. Landuse within the watershed is primarily forest, with some agricultural areas. Population density is low in this area.

REACH CHARACTERISTICS

General observations (Table 2) and habitat assessments (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.

Bogue Chitto Creek at BOCP-2 is a low-gradient, sand-bottomed stream in the Blackbelt region of Alabama. Overall habitat quality was categorized as *suboptimal* due to sedimentation and bank erosion. The reach was also characterized by a relatively straight stream channel, which puts it at risk to impacts from sedimentation and scouring.

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 characterized by pollution-tolerant taxa groups, indicating *poor* community condition (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Drainage Area (mi^2)		32
Ecoregion[a]		65a
% Landuse		
Open water		1
Wetland	Woody	4
	Emergent herbaceous	<1
Forest	Deciduous	24
	Evergreen	10
	Mixed	29
Shrub/scrub		9
Grassland/herbaceous		<1
Pasture/hay		11
Cultivated crops		5
Development	Open space	5
	Low intensity	1
	Moderate intensity	<1
	High intensity	<1
Population/km^2 [b]		8
# NPDES Permits[c]	**TOTAL**	6
Construction Stormwater		1
Mining General Permit (old)		5

a. Blackland Prairie
b. 2000 U.S. Census data
c. #NPDES permits from ADEM's NPDES Management System database, 9 Jun 2008

Table 2. Physical characteristics at BOCP-2, May 26, 2005.

Physical Characteristics		
Width (ft)		20
Canopy cover		Mostly Shaded
Depth (ft)		
	Riffle	0.2
	Run	0.8
	Pool	1.0
% of Reach		
	Riffle	5
	Run	90
	Pool	5
% Substrate		
	Bedrock	2 (clay)
	Cobble	4 (clay)
	Gravel	10 (clay)
	Sand	70
	Silt	2
	Organic Matter	12

Table 3. Results of the habitat assessment conducted May 26, 2005.

Habitat Assessment (% Maximum Score)		Rating
Instream habitat quality	53	Sub-optimal (53-65)
Sediment deposition	40	Marginal (40-52)
Sinuosity	55	Marginal (45-64)
Bank and vegetative stability	49	Marginal (35-59)
Riparian buffer	88	Sub-optimal (70-90)
Habitat assessment score	141	
% Maximum score	**59**	**Sub-optimal (53-65)**

Table 4. Results of the macroinvertebrate bioassessment conducted May 26, 2005.

Macroinvertebrate Assessment Results			
	Results	Scores	Rating
Taxa richness measures		(0-100)	
# Ephemeroptera (mayfly) genera	3	25	Poor (23-46)
# Plecoptera (stonefly) genera	2	33	Fair (32-49)
# Trichoptera (caddisfly) genera	2	17	Very Poor (<22)
Taxonomic composition measures			
% Non-insect taxa	8	68	Fair (49.4-74.1)
% Non-insect organisms	2	95	Good (93.9-97.0)
% Plecoptera	0	1	Very Poor (<6.56)
Tolerance measures			
Beck's community tolerance index	4	14	Very Poor (<20.2)
WMB-I Assessment Score	**---**	**36**	**Poor (24-48)**

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, herbicides (atrazine), and semi-volatile organics) during March through October of 2005 to help identify any stressors to the biological communities.

The fecal coliform count was >2,000 colonies/100 mL in one of 6 (17%) samples collected (July 11th). However, stream flows at the time of collection were documented to be above normal and may account for the elevated fecal coliform results. The stream pH was less than 6.0 standard units (5.3 s.u.) during one of six (17%) sampling events. Generally characterized by clay substrates, low pH is unusual for a Blackland Prairie stream.

CONCLUSIONS

Bioassessment results indicated the macroinvertebrate community to be in *poor* condition, below aquatic life use criteria for its *Fish & Wildlife* use classification. The habitat assessment conducted at the site suggest sedimentation to be a potential cause of the degraded biological condition.

Table 5. Summary of water quality data collected March-October, 2005. Minimum (Min) and maximum (Max) values calculated using minimum detection limits (MDL). Median, average (Avg), and standard deviations (SD) values were calculated by multiplying the MDL by 0.5 when results were less than this value. Metals results were compared to ADEM's chronic aquatic life use criteria adjusted for hardness.

Parameter	N	Min	Max	Median	Avg	SD
Physical						
Temperature (°C)	7	15.0	24.0	18.0	19.4	4.0
Turbidity (NTU)	7	14.8	107.0	29.7	42.9	33.4
Total dissolved solids (mg/L)	6	38.0	109.0	49.5	60.0	26.0
Total suspended solids (mg/L)	6	3.0	61.0	54.0	41.2	24.4
Specific conductance (µmhos)	7	19.3	66.6	43.1	45.7	15.3
Hardness (mg/L)	4	5.4	19.5	11.7	12.1	5.8
Alkalinity (mg/L)	6	3.3	18.7	9.5	10.0	5.0
Stream Flow (cfs)	6	5.2	95.2	39.9	43.2	---
Chemical						
Dissolved oxygen (mg/L)	7	6.4	9.2	7.8	7.7	1.0
pH (su)	7	5.3C	7.5	6.9	6.7	0.7
Ammonia Nitrogen (mg/L)	6	< 0.015	0.034	0.016	0.018	0.012
Nitrate+Nitrite Nitrogen (mg/L)	6	< 0.003	0.136	0.032	0.047	0.050
Total Kjeldahl Nitrogen (mg/L)	6	< 0.150	0.684	0.411	0.397	0.206
Total nitrogen (mg/L)	6	< 0.076	0.722	0.459	0.444	0.210
Dissolved reactive phosphorus (mg/L)	6	< 0.004	0.020	0.014	0.012	0.008
Total phosphorus (mg/L)	6	0.016	0.144	0.093	0.086	0.041
CBOD-5 (mg/L)	6	< 1.0	2.3	1.6	1.4	0.8
Chlorides (mg/L)	6	3.5	6.5	4.5	4.8	1.0
Atrazine (µg/L)	1				<0.05	
Total Metals						
Aluminum (mg/L)	4	< 0.015	0.98	0.2395	0.367	0.4
Iron (mg/L)	4	2.5	3.75	2.915	3.020	0.6
Manganese (mg/L)	4	0.14	0.326	0.2475	0.240	0.1
Dissolved Metals						
Aluminum (mg/L)	4	< 0.015	0.157	0.03825	0.060	0.1
Antimony (µg/L)	4	< 2	< 2	1	1	0
Arsenic (µg/L)	4	< 10	< 10	5	5	0
Cadmium (mg/L)	4	< 0.005	< 0.005	0.0025	0.0025	0.0
Chromium (mg/L)	4	< 0.004	< 0.004	0.002	0.002	0.0
Copper (mg/L)	4	< 0.005	< 0.005	0.0025	0.003	0.0
Iron (mg/L)	4	0.213	0.548	0.297	0.3388	0.1
Lead (µg/L)	4	< 2	< 2	1	1	0
Manganese (mg/L)	4	< 0.005	0.321	0.1035	0.133	0.1
Mercury (µg/L)	4	< 0.3	< 0.3	0.15	0.15	0.0
Nickel (mg/L)	4	< 0.006	< 0.006	0.003	0.003	0.0
Selenium (µg/L)	4	< 10	< 10	5	5	0
Silver (mg/L)	4	< 0.003	< 0.003	0.0015	0.0015	0.0
Thallium (µg/L)	4	< 1	< 1	0.5	0.500	0
Zinc (mg/L)	4	< 0.006	< 0.006	0.003	0.003	0.0
Biological						
J Chlorophyll a (µg/L)	6	0.53	12.82	4.01	5.90	5.6
J Fecal Coliform (col/100 mL)	6	65	> 2400C	175	736	992

N=# samples; M=value > 90th percentile of all verified ecoregional reference reach data collected within ecoregions 65a/b; C=value exceeds criteria for Fish & Wildlife use classification; J=estimate.