

2006 Monitoring Summary



Powell Creek at Marengo County Road 44 Crossing (32.33693/-87.75558)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Powell Creek watershed for biological and water quality monitoring as part of the 2001 Basin-wide Screening Assessment of the Escatawpa, Mobile, and Tombigbee (EMT) River Basins. The screening assessments were conducted at stream reaches where land use estimates and non-point source information from the local Soil and Water Conservation Districts indicated a moderate or high potential for impairment from non-point sources in non-urban areas. Results of the 2001 screening-level evaluation identified Powell Creek at PWLM-32 for further monitoring during the 2006 Basin Assessment of the EMT River Basins to more fully assess biological conditions at the site, as well as the extent and cause of any impairment.



Photo 1. Powell Creek at PWLM-32, January, 2010.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Powell Creek at PWLM-32 is a *Fish & Wildlife (F&W)* stream located in Marengo County. Land use within the watershed is primarily pasture (53%) with some forest and wetlands. The population density is relatively low. The Department has issued five NPDES permits in this 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. Powell Creek at PWLM-32 is a shallow, high-gradient stream with sand and bedrock substrates (Figure 1). Overall habitat quality was rated as *optimal*.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin	Lower Tombigbee River	
Drainage Area (mi ²)	67	
Ecoregion ^a	65b	
% Landuse		
Open water		2
Wetland	Woody	13
	Emergent herbaceous	1
Forest	Deciduous	10
	Evergreen	4
	Mixed	6
Shrub/scrub		6
Grassland/herbaceous		<1
Pasture/hay		53
Cultivated crops		2
Development	Open space	3
	Low intensity	<1
	Moderate intensity	<1
Population/km ^{2b}	6	
# NPDES Permits ^c	TOTAL	5
	Construction Stormwater	4
	Industrial General	1

a.Flatwoods/Blackland Prairie Margins

b.2000 US Census

c.#NPDES permits downloaded from ADEM's NPDES Management System database, Sept. 18, 2009

Table 2. Physical characteristics of Powell Creek at PWLM-32 on May 31, 2006.

Physical Characteristics		
Width (ft)	30	
Canopy cover	Mostly Open	
Depth (ft)	Riffle	0.3
	Run	1.0
	Pool	2.0
% of Reach	Riffle	5.0
	Run	75
	Pool	20
% Substrate	Bedrock	35
	Cobble	2
	Gravel	15
	Sand	39
	Silt	2
	Organic Matter	7

Table 3. Results of the habitat assessment of Powell Creek at PWLM-32 conducted May 31, 2006.

Habitat Assessment	(% Max Score)	Rating
Instream habitat quality	58	Sub-optimal (53-65)
Sediment deposition	75	Optimal (>65)
Sinuosity	65	Sub-optimal (65-84)
Bank and vegetative stability	65	Sub-optimal (60-74)
Riparian buffer	90	Sub-optimal (70-90)
Habitat assessment score	169	
% Maximum score	70	Optimal (>65)

BIOASSESSMENT RESULTS

Benthic macroinvertebrate communities were sampled using ADEM's Intensive Multi-habitat Bioassessment methodology (WMB-I). The WMB-I measures 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 each metric score. Metric results indicated that the macroinvertebrate community to be in *poor* condition (Table 4).

Table 4. Results of the macroinvertebrate bioassessment of Powell Creek at PWLM-32, May 31, 2006.

Macroinvertebrate Assessment			
	Results	Scores	Rating
Taxa richness measures	(0-100)		
# Ephemeroptera (mayfly) genera	8	67	Fair (47-70)
# Plecoptera (stonefly) genera	1	17	Poor (16-31)
# Trichoptera (caddisfly) genera	5	42	Poor (22-44)
Taxonomic composition measures			
% Non-insect taxa	6	76	Good (74.2-87.1)
% Non-insect organisms	8	79	Fair (62.8-93.9)
% Plecoptera	0	0	Very Poor (<6.56)
Tolerance measures			
Beck's community tolerance index	4	14	Very Poor (<20.2)
WMB-I Assessment Score	--	42	Poor (24-48)

WATER CHEMISTRY

Results of water chemistry analyses are summarized in Table 5. When possible, in situ measurements and water samples are collected monthly, semi-monthly (metals), or quarterly (pesticides, herbicides (atrazine), and semi-volatile organics) during March through October to help identify any stressors to the biological communities. Median conductivity, hardness, alkalinity, and chloride levels were higher than expected based on 90th percentile of ecoreference streams. One fecal coliform sample result exceeded established criteria for a *F&W* stream, but this may be explained by the samplers' comments that a heavy rain band had moved through the area prior to sampling the stream.

SUMMARY

Bioassessment results indicate the macroinvertebrate community to be in *poor* condition despite the habitat assessment score of *optimal* for biological communities. As part of the assessment process, ADEM will review the information in this report along with all other available data.

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Table 5. Summary of water quality data collected March-October, 2006. 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. Metals results were compared to ADEM's chronic aquatic life use criteria adjusted for hardness.

Parameter	N	Min	Max	Med	Avg	SD	Q
Physical							
Temperature °C	6	17.0	32.0	25.0	24.7	5.9	
Turbidity (NTU)	6	3.5	93.0	4.7 ^M	21.7	35.5	
Total Dissolved Solids (mg/L)	5	130.0	220.0	167.0	179.0	39.4	
Total Suspended Solids (mg/L)	5	3.0	115.0	6.0	30.6	47.9	
Specific Conductance (µmhos)	6	171.0	366.8	284.8 ^M	279.5	66.9	
Hardness (mg/L)	1				114.0		
Alkalinity (mg/L)	5	73.4	153.3	103.7 ^M	112.7	30.5	
Stream Flow (cfs)	3	3.3	52.7	8.1	21.4	27.2	
Chemical							
Dissolved Oxygen (mg/L)	6	6.9	10.5	8.5	8.5	1.2	
pH (su)	6	6.8	8.3	7.9	7.7	0.5	
Ammonia Nitrogen (mg/L)	5	< 0.015	0.052	0.008	0.019	0.019	
Nitrate+Nitrite Nitrogen (mg/L)	5	< 0.003	0.051	0.012	0.017	0.020	
Total Kjeldahl Nitrogen (mg/L)	5	0.287	0.965	0.529	0.612	0.258	
Total Nitrogen (mg/L)	5	< 0.288	1.016	0.542	0.630	0.273	
Dissolved Reactive Phosphorus (mg/L)	5	< 0.004	0.058	0.002	0.013	0.025	
Total Phosphorus (mg/L)	5	< 0.042	0.147	0.050	0.070	0.044	
CBOD-5 (mg/L)	5	< 0.8	3.3	1.1	1.5	1.1	
COD (mg/L)	1				2.0		
TOC (mg/L)	1				7.9		
Chlorides (mg/L)	3	10.8	14.7	11.4 ^M	12.3	2.1	
Atrazine (µg/L)	1				0.05		
Total Metals							
Aluminum (mg/L)	1				0.143		
Iron (mg/L)	1				0.217		
Manganese (mg/L)	1				0.057		
Dissolved Metals							
Aluminum (mg/L)	1				0.050		
Antimony (µg/L)	1				10.0		
Arsenic (µg/L)	1				10		
Cadmium (mg/L)	1				0.015		
Chromium (mg/L)	1				0.050		
Copper (mg/L)	1				0.050		
Iron (mg/L)	1				0.050		
Lead (µg/L)	1				10		
Manganese (mg/L)	1				0.020		
Mercury (µg/L)	1				0.0		
Nickel (mg/L)	1				0.050		
Selenium (µg/L)	1				50.0		
Silver (mg/L)	1				0.050		
Thallium (µg/L)	1				10.0		
Zinc (mg/L)	1				0.050		
Biological							
Chlorophyll a (ug/L)	5	1.34	46.99	2.56	11.27	19.99	
Fecal Coliform (col/100 mL)	4	14	4,500 ^C	205	1,231	2,182	J

J=estimate; N= # of samples; M=value >90% of collected samples in ecoregion 65b; C=value exceeds estab-