

2007 Monitoring Summary



Basin Assessment Site

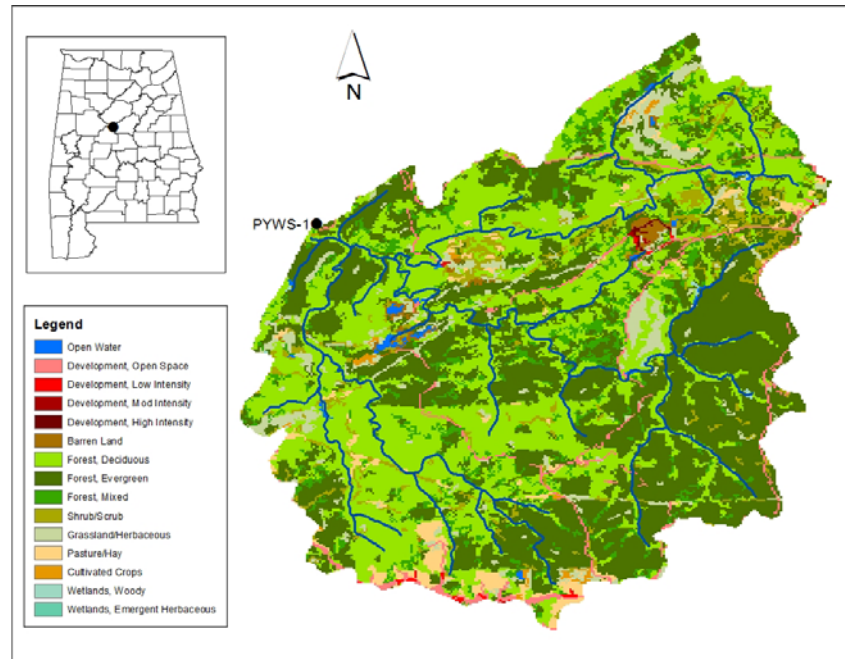
Piney Woods Creek at Shelby County Road 270 (33.21078/-86.95475)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Piney Woods Creek watershed for biological and water quality monitoring as part of the [2007 Black Warrior Cahaba \(BWC\) Basin Assessment Monitoring](#). The objectives of the BWC Basin Assessments were to assess biological conditions at each monitoring location, estimate overall water quality within the basin, identify impaired and reference reaches, and collect data for metric and criteria development.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Cahaba River
Drainage Area (mi ²)		20
Ecoregion ^a		67h
% Landuse		
Open water		<1
Wetland	Woody	<1
Forest	Deciduous	39
	Evergreen	38
	Mixed	7
Shrub/scrub		4
Grassland/herbaceous		5
Pasture/hay		3
Cultivated crops		<1
Development	Open space	2
	Low intensity	<1
	Moderate intensity	<1
	High intensity	<1
Barren		1
Population/km ² ^b		54
# NPDES Permits ^c	TOTAL	12
	Construction Stormwater	1
	Mining	9
	Municipal Individual	1
	Underground Injection Control	1



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

Figure 1. Watershed Characteristics of Piney Woods Creek at PYWS-1.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Piney Woods Creek is a [Fish & Wildlife \(F&W\)](#) stream located in Shelby County. Based on the 2000 National Land Cover Dataset, landuse within the watershed is primarily forest (84%) with patches of shrubs, grasslands and pasture (Figure 1). As of February 23, 2011, twelve NPDES permits have been issued in this monitoring area, including nine mining permits.

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. Piney Woods Creek at PYWS-1 is a moderate gradient stream predominantly with gravel and sand substrates. This watershed lies in the Southern Sandstone Ridges sub-ecoregion (67h). 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 individual metric scores. Metric results indicated the macroinvertebrate community to be in *fair* community condition (Table 4).

Table 2. Physical Characteristics of Piney Woods Creek at PYWS-1, May 15, 2007.

Physical Characteristics		
Width (ft)		15
Canopy Cover		Estimate 50/50
Depth (ft)	Riffle	0.1
	Run	1.5
	Pool	2.5
% of Reach	Riffle	25
	Run	50
	Pool	25
% Substrate	Bedrock	1
	Boulder	2
	Clay	2
	Cobble	5
	Gravel	50
	Sand	31
	Silt	2
	Organic Matter	7

Table 3. Results of the habitat assessment conducted on Piney Woods Creek at PYWS-1, May 15, 2007.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	78	Optimal >70
Sediment Deposition	74	Optimal >70
Sinuosity	93	Optimal >84
Bank and Vegetative Stability	74	Sub-optimal (60-74)
Riparian Buffer	86	Sub-optimal (70-89)
Habitat Assessment Score	185	
% Maximum Score	77	Optimal >70

Table 4. Results of the macroinvertebrate bioassessment conducted in Piney Woods Creek at PYWS-1, May 15, 2007.

Macroinvertebrate Assessment			
	Results	Scores	Rating
Taxa richness measures		(0-100)	
# Ephemeroptera (mayfly) genera	8	67	Fair (47-70)
# Plecoptera (stonefly) genera	2	33	Fair (32-49)
# Trichoptera (caddisfly) genera	9	75	Good (67-83)
Taxonomic composition measures			
% Non-insect taxa	8	70	Fair (49.5-74.1)
% Non-insect organisms	17	55	Poor (31.3-62.7)
% Plecoptera	8	39	Good (19.8-59.8)
Tolerance measures			
Beck's community tolerance index	13	46	Fair (41.0-60.9)
WMB-I Assessment Score	--	55	Fair (49-72)

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. [In situ measurements](#) and [water samples](#) were collected monthly, seasonally (metals), or semi-annually (pesticides, atrazine, and semi-volatile organics) during March through October of 2007 to help identify any stressors to the biological communities. *In situ* parameters suggested that Piney Woods Creek at PYWS-1 was meeting the water quality criteria for [F&W](#) use classification. However, median values of total dissolved solids, specific conductance, hardness, alkalinity, chlorides, metals (total aluminum, manganese, dissolved antimony, and manganese) were higher than the values expected based on reference reach data collected in ecoregion 67h. Dissolved arsenic concentration exceeded Human Health (HH) criterion applicable to its [F&W](#) use classification in July and September. Thallium exceeded the HH criterion in March. Dissolved copper exceeded the Aquatic Life Use (ALU) criterion in September. Organics results were all less than MDL.

SUMMARY

As part of [assessment process](#), ADEM will review the monitoring information presented in this report along with all other available data.

Bioassessment results indicated the macroinvertebrate community to be in *fair* condition. The overall habitat assessment score was *optimal* with good instream habitat. Similar results were obtained during a Screening Level Assessment conducted by ADEM in 2002. Intensive water chemistry results indicate that the main stressors to the biological community in Piney Woods Creek were total dissolved solids, specific conductance, hardness, alkalinity, chlorides and certain metals. Mining activities along the watershed may be the source of these stressors.

Table 5. Summary of water quality data collected March-October, 2007. 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.

Parameter	N	Min	Max	Med	Avg	SD	Q	E
Physical								
Temperature (°C)	9	13.9	24.2	20.1	20.4	3.4		
Turbidity (NTU)	9	2.4	272.0	3.5	38.7	88.7		
Total Dissolved Solids (mg/L)	8	179.0	380.0	314.0 ^M	302.0	64.3		
Total Suspended Solids (mg/L)	8	< 1.0	105.0	3.0	15.6	36.2		
Specific Conductance (µmhos)	9	260.0	540.0	448.0 ^G	417.4	98.8		
Hardness (mg/L)	4	80.7	171.0	156.0 ^G	140.9	41.0		
Alkalinity (mg/L)	8	41.8	175.2	114.0 ^M	106.2	44.5		
Stream Flow (cfs)	8	0.4	11.6	1.7	3.5	3.9		
Chemical								
Dissolved Oxygen (mg/L)	8	6.5	10.8	8.4	8.5	1.2		
pH (su)	9	7.3	7.7	7.6	7.6	0.1		
Ammonia Nitrogen (mg/L)	8	< 0.015	0.023	0.008	0.010	0.006		
Nitrate+Nitrite Nitrogen (mg/L)	8	< 0.003	0.951	0.050	0.190	0.328		
Total Kjeldahl Nitrogen (mg/L)	8	< 0.150	1.910	0.240	0.490	0.630	J	
Total Nitrogen (mg/L)	8	< 0.118	2.861	0.266	0.680	0.933	J	
Dissolved Reactive Phosphorus (mg/L)	8	< 0.004	< 0.005	0.002	0.002	0.001		
Total Phosphorus (mg/L)	8	< 0.013	< 0.100	0.028	0.028	0.013	J	
CBOD-5 (mg/L)	8	< 0.3	1.4	0.5	0.6	0.3		
Chlorides (mg/L)	8	3.9	38.6	10.5 ^M	14.3	12.1		
Atrazine (µg/L)	2	< 0.05	< 0.05	0.02	0.02	0.00		
Total Metals								
Aluminum (mg/L)	4	< 0.060	2.290	0.438 ^M	0.799	1.066		
Iron (mg/L)	4	0.209	1.680	0.352	0.648	0.691		
Manganese (mg/L)	4	0.062	0.147	0.114 ^M	0.110	0.035		
Dissolved Metals								
Aluminum (mg/L)	4	< 0.050	0.438	0.025	0.128	0.206		
Antimony (µg/L)	4	< 10.0	< 10.0	5.0 ^M	5.0	0.0		
Arsenic (µg/L)	4	< 0.3	0.8 ^H	0.5	0.5	0.4	2	
Cadmium (mg/L)	4	< 0.002	< 0.015	0.004	0.004	0.004		
Chromium (mg/L)	4	< 0.002	< 0.050	0.013	0.013	0.014		
Copper (mg/L)	4	< 0.008	< 0.050 ^A	0.022	0.020	0.008	1	
Iron (mg/L)	4	0.020	0.125	0.052	0.062	0.046		
Lead (µg/L)	4	< 0.5	< 2.0	0.2	0.4	0.4		
Manganese (mg/L)	4	0.050	0.112	0.096 ^M	0.088	0.028		
Mercury (µg/L)	4	< 0.0	< 0.0	0.0	0.0	0.0		
Nickel (mg/L)	4	< 0.002	< 0.050	0.013	0.013	0.014		
Selenium (µg/L)	4	< 0.3	0.6	0.4	0.4	0.2		
Silver (mg/L)	4	< 0.005	< 0.050	0.002	0.008	0.011		
Thallium (µg/L)	4	< 0.7	1.4 ^H	0.4	0.6	0.5	1	
Zinc (mg/L)	4	< 0.017	< 0.050	0.022	0.020	0.008		
Biological								
Chlorophyll a (ug/L)	7	< 1.00	1.34	0.50	0.62	0.32		
Fecal Coliform (col/100 mL)	8	7	> 1,200	26	172	416	J	

J=estimate; N=# samples; Q=qualifier; E=# samples that exceeded criteria; M=value > 90th percentile of all verified ecoregional reference reach data collected within ecoregions 67h; G=value > median of all ecoregional reference reach data collected in ecoregion 67h; A= (F&W) aquatic life use criterion ex-

FOR MORE INFORMATION, CONTACT:
 Sreeletha P Kumar, ADEM Environmental Indicators Section
 1350 Coliseum Boulevard Montgomery, AL 36110
 (334) 260-2782 skumar@adem.state.al.us