Alabama Department of Environmental Management

Basin Assessment Site

Rivers and Streams Monitoring Program

2010 Monitoring Summary

Good

Pine Barren Creek at Seventh Avenue (Butler County) (31.82898/-86.83462)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Pine Barren Creek watershed for biological and water quality monitoring as part of the 2010 Assessment of the Alabama, Coosa, and Tallapoosa (ACT) River Basins. The objectives of these monitoring activities were to assess the biological integrity of each sampling location and to estimate overall water quality within the ACT basins.

Figure 1. Pine Barren Creek at PNBB-2 on May 6, 2010, facing downstream.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Alabama River
Drainage Area (mi²)		19
Ecoregion[a]		65d
% Landuse		
Open water		<1
Wetland	Woody	2
	Emergent herbaceous	<1
Forest	Deciduous	29
	Evergreen	27
	Mixed	9
Shrub/scrub		12
Grassland/herbaceous		<1
Pasture/hay		13
Cultivated crops		5
Development	Open space	3
	Low intensity	<1
Population/km²[b]		3
# NPDES Permits[c]	TOTAL	1
Construction Stormwater		1

a. Southern Hilly Gulf Coastal Plain
b. 2000 US Census
c. #NPDES permits downloaded from ADEM's NPDES Management System database, February 23, 2011

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Pine Barren Creek is a *Swimming/Fish and Wildlife (S/F&W)* stream located in Butler County near the town of Saucer. At PNBB-2, the stream drains approximately nineteen square miles of countryside and has very little development. Based on the 2000 National Land Cover Dataset, landuse within the watershed is primarily forest (65%) with some agricultural (18%) and shrub/scrub areas. The ADEM has issued one NPDES permit in the Pine Barren Creek watershed as of February 23, 2011.

Table 2. Physical characteristics of Pine Barren Creek at PNBB-2, May 12, 2010.

Physical Characteristics		
Width (ft)		18
Canopy Cover		Shaded
Depth (ft)		
	Run	2.0
	Pool	3.0
% of Reach		
	Run	80
	Pool	20
% Substrate		
	Mud/Muck	5
	Sand	70
	Organic Matter	25

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. Pine Barren Creek at PNBB-2 is a glide-pool stream characterized primarily by sand and organic matter (Figure 1). Although overall habitat quality was categorized as *sub-optimal*, the availability and diversity of instream habitat was limited.

BIOASSESSMENT RESULTS

Benthic macroinvertebrate communities were sampled using ADEM's Intensive Multi-habitat Bioassessment methodology (WMB-I). Measures of taxonomic richness, community composition, and community tolerance are used to assess the overall health of the macroinvertebrate community in comparison to conditions expected in south Alabama streams and rivers. Each site is placed in one of six levels, ranging from 1, or *natural* to 6, or *highly altered*. The macroinvertebrate survey conducted in Pine Barren Creek at PNBB-2 rated the site as *good*.(Table 4).

Table 3. Results of the habitat assessment conducted on Pine Barren Creek at PNBB-2, May 12, 2010.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	45	Marginal (40-52)
Sediment Deposition	63	Sub-optimal (53-65)
Sinuosity	40	Poor <45
Bank and Vegetative Stability	65	Sub-optimal (60-74)
Riparian Buffer	80	Sub-optimal (70-89)
Habitat Assessment Score	**134**	
% Maximum Score	**61**	**Sub-optimal (53-65)**

Table 4. Results of macroinvertebrate bioassessment conducted in Pine Barren Creek at PNBB-2, May 12, 2010.

Macroinvertebrate Assessment	Results
Taxa richness and diversity measures	
Total # Taxa	46
# EPT taxa	14
# Highly-sensitive and Specialized Taxa	3
Taxonomic composition measures	
% EPC taxa	35
% EPT minus Baetidae and Hydropsychidae	15
% Chironomidae Individuals	79
% Dominant Taxon	73
% Individuals in Dominant 5 Taxa	86
Functional feeding group	
# Collector Taxa	14
% Tolerant Filterer Taxa	15
Community tolerance	
# Sensitive EPT	8
% Sensitive taxa	33
% Nutrient Tolerant individuals	74
WMB-I Assessment Score	**3**
WMB-I Assessment Rating	**Good**

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, atrazine, and semi-volatile organics) during May through November of 2010 to help identify any stressors to the biological communities. Stream pH exceeded *S/F&W* use classification criterion, July 13, 2010. The dissolved arsenic concentration exceeded the Human Health criterion, May 6, 2010. Median concentrations of dissolved metals (chromium, copper, nickel, and zinc) and nitrate+nitrite nitrogen were higher than expected, based on the 90th percentile of data collected at reference reaches within the Southern Hilly Gulf Coastal Plain ecoregion (65d).

SUMMARY

Bioassessment results indicated the macroinvertebrate community to be in *good* condition, despite limited instream habitat. Intensive water quality sampling indicated higher than expected concentrations of nitrogen and some dissolved metals. Monitoring should continue to ensure that conditions remain stable.

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Table 5. Summary of water quality data collected May-November, 2010. Minimum (Min) and maximum (Max) values calculated using minimum detection limits (MDL). Median (Med), 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)	5	16.6	23.5	19.1	19.8	2.6	
Turbidity (NTU)	5	8.1	13.5	10.8	10.6	2.5	
Total Dissolved Solids (mg/L)	4	26.0	40.0	34.0	33.5	7.6	
Total Suspended Solids (mg/L)	4	3.0	15.0	8.0	8.5	5.2	
Specific Conductance (µmhos)	5	23.7	25.6	24.3	24.4	0.7	
Hardness (mg/L)	4	5.9	6.8	6.4	6.4	0.4	
Alkalinity (mg/L)	4	4.9	7.2	5.3	5.7	1.1	
Stream Flow (cfs)	5	13.3	29.3	17.6	20.1	6.4	
Chemical							
Dissolved Oxygen (mg/L)	5	7.6	8.6	8.2	8.1	0.3	
pH (su)	5	5.5 C	6.4	6.3	6.1	0.4	1
Ammonia Nitrogen (mg/L)	4	< 0.021	< 0.021	0.010	0.010	0.000	
Nitrate+Nitrite Nitrogen (mg/L)	4	0.153	0.214	0.168 M	0.176	0.026	
Total Kjeldahl Nitrogen (mg/L)	4	< 0.080	0.413	0.134	0.180	0.179	
Total Nitrogen (mg/L)	4	< 0.193	0.584	0.324	0.356	0.190	
J Dissolved Reactive Phosphorus (mg/L	4	0.004	0.011	0.008	0.008	0.003	
! Total Phosphorus (mg/L)	4	0.009	0.019	0.011	0.012	0.005	
CBOD-5 (mg/L)	4	< 2.0	< 2.0	1.0	1.0	0.0	
Chlorides (mg/L)	4	2.5	3.2	2.9	2.9	0.3	
Atrazine (µg/L)	2	< 0.02	< 0.02	0.01	0.01	0.00	
Total Metals							
! Aluminum (mg/L)	4	< 0.043	0.266	0.164	0.154	0.114	
Iron (mg/L)	4	1.330	2.680	1.820	1.912	0.623	
Manganese (mg/L)	4	0.056	0.132	0.076	0.085	0.035	
Dissolved Metals							
! Aluminum (mg/L)	4	< 0.033	0.061	0.019	0.029	0.022	
Antimony (µg/L)	4	< 1.9	< 1.9	0.9	0.9	0.0	
J Arsenic (µg/L)	4	0.7 J	< 2.1	1.0	1.0	0.2	1
Cadmium (mg/L)	4	< 0.001	< 0.014	0.001	0.002	0.003	
Chromium (mg/L)	4	< 0.009	< 0.013	0.006 M	0.006	0.001	
Copper (mg/L)	4	< 0.013	< 0.020	0.006 M	0.007	0.002	
J Iron (mg/L)	4	0.196	0.238	0.228	0.222	0.019	
Lead (µg/L)	4	< 1.7	< 1.7	0.8	0.8	0.0	
! Manganese (mg/L)	4	< 0.001	0.087	0.042	0.043	0.036	
Mercury (µg/L)	4	< 0.08	< 0.08	0.04	0.04	0.0	
Nickel (mg/L)	4	< 0.019	< 0.042	0.010 M	0.012	0.006	
Selenium (µg/L)	4	< 1.7	< 1.7	0.8	0.8	0.0	
Silver (mg/L)	4	< 0.001	< 0.002	0.001	0.001	0.001	
Thallium (µg/L)	4	< 0.6	< 0.6	0.3	0.3	0.0	
Zinc (mg/L)	4	< 0.012	< 0.030	0.015 M	0.013	0.004	
Biological							
Chlorophyll a (µg/L)	4	< 0.10	1.07	0.05	0.30	0.51	
E. coli (col/100mL)	4	150	308	283	256	72	

J=estimate; N=# samples; C=value exceeds established criteria for S/*F&W* use classification; H=S/*F&W* human health criterion exceeded; M=value > 90% of all verified ecoregional reference reach data collected in the ecoregion 65d; E=# samples that exceed criterion.