Alabama Department of Environmental Management

Ambient Monitoring Site

Rivers and Streams Monitoring Program

2010 Monitoring Summary

Poor

Pepperell Branch at US Hwy 29 in Lee County (32.63470/-85.42540)

BACKGROUND

Pepperell Branch at PPLL-2 is one of a network of 103 sites monitored annually by the Alabama Department of Environmental Management (ADEM) to identify long-term trends in water quality and to provide data for the development of TMDLs and water quality criteria.

Pepperell Branch has been on Alabama's Clean Water Act (CWA) §303(d) list of impaired waters for not meeting its *Fish and Wildlife* (*F&W*) water use classifications since 1998. It is listed for nutrients and pathogens from industrial and municipal sources. During 2010, ADEM collected additional data from Pepperell Branch for the development of nutrient and pathogen Total Maximum Daily Loads (TMDLs).

Additionally, Pepperell Branch was selected for biological and water quality monitoring as part of the 2010 Assessment of the Alabama, Coosa, 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. Pepperell Branch at PPLL-2, April 14, 2010.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Pepperell Branch is located near Opelika, Alabama, in the Southern Outer Piedmont ecoregion (45b). Based on the 2006 National Land Cover Dataset, landuse within the watershed is primarily development (66%) followed by forest (25%) and pasture/hay. Population density is relatively high. As of June 6, 2013, ADEM has issued 54 construction permits in this watershed.

REACH CHARACTRISTICS

General observations (Table 2) and a habitat assessment (Table 3) were completed as part of a macroinvertebrate assessment conducted in June (Table 4). 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. Pepperell Branch at PPLL-2 is a riffle-run stream with sand, gravel, and silt substrates (Figure 1). Overall habitat quality was categorized as *marginal* due to sediment deposition, bank erosion, limited riparian buffer areas, and a lack of stable instream substrates.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Tallapoosa River
Drainage Area (mi^2)		5
Ecoregion[a]		45b
% Landuse		
Open water		<1
Wetland	Woody	<1
Forest	Deciduous	11
	Evergreen	12
	Mixed	2
Shrub/scrub		<1
Grassland/herbaceous		2
Pasture/hay		6
Cultivated crops		<1
Development	Open space	18
	Low intensity	31
	Moderate intensity	11
	High intensity	6
Barren		<1
Population/km^2 [b]		493
# NPDES Permits[c]	**TOTAL**	54
Construction Stormwater		42
Industrial General		4
Industrial Individual		3
Municipal Individual		2
Underground Injection Control		3

a.Southern Outer Piedmont
b.2000 US Census
c.#NPDES permits downloaded from ADEM's NPDES Management System database, June 6 , 2013.

Table 2. Physical characteristics of Pepperell Branch at PPLL-2, June 22, 2010.

Physical Characteristics		
Canopy Cover		Shaded
Width (ft)		15
Depth (ft)		
	Riffle	0.4
	Run	1.0
	Pool	2.0
% of Reach		
	Riffle	5
	Run	60
	Pool	35
% Substrate		
	Boulder	1
	Cobble	2
	Mud/Muck	5
	Gravel	20
	Sand	52
	Silt	15
	Organic Matter	5

Table 3. Results of the habitat assessment conducted on Pepperell Branch at PPLL-2, June 22, 2010.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	47	Marginal (41-58)
Sediment Deposition	43	Marginal (41-58)
Sinuosity	43	Poor <45
Bank and Vegetative Stability	35	Marginal (35-59)
Riparian Buffer	51	Marginal (50-69)
Habitat Assessment Score	**106**	
% Maximum Score	**44**	**Marginal (41-58)**

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 in comparison to reference reaches in the same ecoregion. The final score is the average of all individual metric scores. Metric results indicated the macroinvertebrate community to be in *poor* community condition (Table 4).

Table 4. Results of the macroinvertebrate bioassessment conducted in Pepperell Branch at PPLL-2, June 22, 2010.

Macroinvertebrate Assessment		
	Results	**Scores**
Taxa richness and diversity measures		**(0-100)**
# EPT taxa	3	0
Shannon Diversity	3.01	14
Taxonomic composition measures		
% EPT minus Baetidae and Hydropsychidae	5	9
% Non-insect taxa	9	69
Tolerance measures		
% Tolerant taxa	41	21
WMB-I Assessment Score	**---**	**23**
WMB-I Assessment Rating		**Poor (23-46)**

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. *In situ* measurements and water samples were collected monthly from April through November of 2010 to help identify any stressors to the biological communities. Five in situ measurements and E. coli samples were collected in June and in August to determine if instream pathogen concentrations met all *F&W* criteria. The first sample collected each month was used to calculate the values presented in Table 5.

In May and August, counts of E. coli bacteria exceeded the *F&W* criterion for single samples collected June through September. The geometric means of both June and September samples also exceeded the *F&W* criterion. Total Kjeldahl nitrogen was the only nutrient higher than expected for Piedmont streams, based on the 90th percentile of data from reference reaches in this ecoregion.

The median concentration of specific conductivity was four times greater than the median concentration of all verified reference reach data collected in ecoregion 45. The median concentration of total dissolved solids, and chlorides were also higher than expected based on the 90th percentile of ecoregional reference data.

Table 5. Summary of water quality data collected April-November, 2010. 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	E
Physical							
Temperature (°C)	9	16.2	27.0	22.6	22.1	3.8	
Turbidity (NTU)	8	3.1	35.0	10.0	14.1	12.0	
Total Dissolved Solids (mg/L)	8	70.0	114.0	98.0 M	96.0	15.7	
J Total Suspended Solids (mg/L)	8	< 1.0	31.0	4.5	7.0	10.0	
Specific Conductance (µmhos)	8	115.5	189.5	179.9 G	167.3	26.5	
Alkalinity (mg/L)	8	27.0	70.6	63.7	57.3	14.8	
Stream Flow (cfs)	8	0.1	4.5	2.1	2.2	1.8	
Chemical							
Dissolved Oxygen (mg/L)	8	5.1	8.6	6.6	6.7	1.0	
pH (su)	8	6.3	7.3	6.8	6.7	0.4	
Ammonia Nitrogen (mg/L)	8	< 0.021	0.369	0.010	0.061	0.125	
Nitrate+Nitrite Nitrogen (mg/L)	8	0.156	0.528	0.274	0.320	0.149	
Total Kjeldahl Nitrogen (mg/L)	8	0.194	0.886	0.388 M	0.447	0.223	
Total Nitrogen (mg/L)	8	0.448	1.314	0.661	0.767	0.329	
J Dissolved Reactive Phosphorus (mg/L)	8	0.005	0.037	0.014	0.015	0.010	
Total Phosphorus (mg/L)	8	0.018	0.094	0.030	0.038	0.025	
J CBOD-5 (mg/L)	8	< 2.0	< 2.0	1.0	1.0	0.0	
Chlorides (mg/L)	8	4.2	11.9	9.5 M	8.8	2.6	
Biological							
Chlorophyll a (ug/L)	8	< 0.27	1.60	1.07	0.96	0.50	
J E. coli (col/100mL)	8	81.3	1553.1	196.4 C	483.2	592.2	2

C= value exceeds established criteria for *F&W* water use classification; E=# samples that exceeded criteria; G= value higher than median concentration of all verified ecoregional reference reach data collected in the ecoregion 45; J=Estimate; M= value>90% of all verified ecoregional refernce reach data collected in the ecoregion 45; N= # samples.

SUMMARY

The 2010 habitat and bioassessment studies indicated the macroinvertebrate community in Pepperell Branch at PPLL-2 to be in *poor* condition. Habitat assessment information indicated the reach to be characterized by sediment deposition, bank erosion, limited riparian buffer areas, and a lack of stable instream substrates.

Intensive water quality data identified specific conductivity, total dissolved solids, Kjeldahl nitrogen, chlorides, and E. coli to be concerns within this reach.

FOR MORE INFORMATION, CONTACT:
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