Alabama Department of Environmental Management

303(d)/TMDL

Rivers and Streams Monitoring Program

2006 Monitoring Summary

Good™

Puppy Creek at Mobile County Road 21 (30.9842/-88.4011)

BACKGROUND

The ten mile segment of Puppy Creek from AL Hwy 217 upstream to its source in Citronelle has been on Alabama's Clean Water Act (CWA) §303(d) list of impaired waters since 1996. It was listed for pathogens and nutrients due to storm sewer and urban runoff. ADEM monitored Puppy Creek at PPYM-1 downstream of the listed reach to investigate the extent of the impairment. Monthly water chemistry samples were also collected. These data were used to develop Total Maximum Daily Loads (TMDLs) which were approved by the EPA in 2004 (pathogens) and 2008 (nutrients).

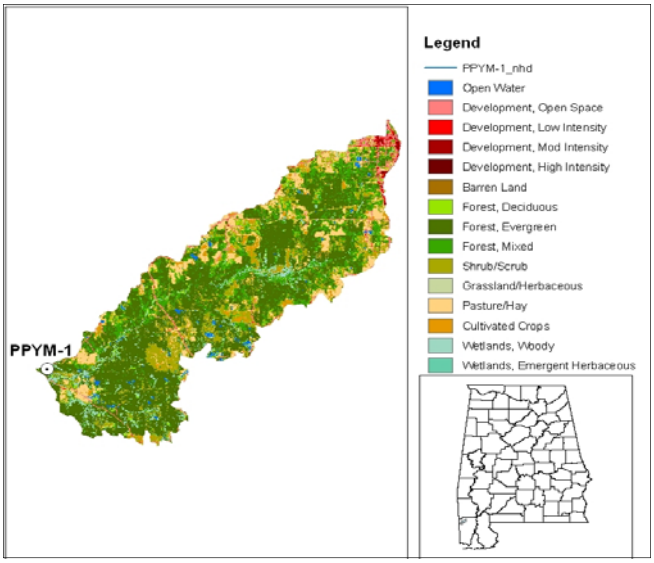

Figure 1. Land use map of Puppy Creek at PPYM-1 .

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Puppy Creek at PPYM-1 is a low-gradient *Fish & Wildlife (F&W)* stream in Mobile County. Land use within the watershed is primarily forest (61%) with some shrub/scrub and pastureland (Figure 1). The Department has issued seven 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. Puppy Creek at PPYM-1 is a sand-bottomed, glide-pool stream typical of the Southern Pine Plains and Hills sub-ecoregion. Overall habitat quality was rated as *marginal* due to limited instream habitat, a straight stream channel, and eroded banks.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Escatawpa River
Drainage Area (mi^2)		42
Ecoregion[a]		65f
% Landuse		
Open water		1
Wetland	Woody	4
	Emergent herbaceous	<1
Forest	Deciduous	3
	Evergreen	44
	Mixed	14
Shrub/scrub		15
Grassland/herbaceous		<1
Pasture/hay		10
Cultivated crops		3
Development	Open space	3
	Low intensity	1
	Moderate intensity	<1
	High intensity	<1
Population/km^2[b]		22
# NPDES Permits[c]	**TOTAL**	7
Construction Stormwater		3
Industrial General		1
Industrial Individual		1
Municipal Individual		1
Underground Injection Control		1

a. Southern Pine Plains & Hills
b. 2000 US Census
c. #NPDES permits downloaded from ADEM's NPDES Management System database, 9 June 2008

Table 2. Physical characteristics at Puppy Creek at PPYM-1 on May 23, 2006.

Physical Characteristics		
Width (ft)		30
Canopy cover		Mostly Open
Depth (ft)	Run	1.0
	Pool	2.0
% of Reach	Run	80
	Pool	20
% Substrate	Gravel	1
	Sand	89
	Organic Matter	10

Table 3. Results of the habitat assessment of Puppy Creek at PPYM-1 May 23, 2006.

Habitat Assessment (% Max Score)		Rating
Instream habitat quality	36	Poor (<40)
Sediment deposition	59	Sub-optimal (53-65)
Sinuosity	33	Poor (<45)
Bank and vegetative stability	45	Marginal (35-59)
Riparian buffer	83	Sub-optimal (70-90)
Habitat assessment score	111	
% Maximum score	**50**	**Marginal (40-52)**

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 score is based on a 100 point scale. The final score is the average of the individual metric scores. The metric results indicated the macroinvertebrate community to be in *good* condition (Table 4).

Table 4. Results of the macroinvertebrate bioassessment of Puppy Creek at PPYM-1 on May 23, 2006.

Macroinvertebrate Assessment			
	Results	**Scores**	**Rating**
Taxa richness measures			
# EPT genera	19	76	Good (57-78)
Taxonomic composition measures			
% Non-insect taxa	24	5	Very Poor (<30.9)
% Plecoptera	11	53	Excellent (>52.8)
% Dominant taxa	16	86	Excellent (>85.2)
Functional composition measures			
% Predators	21	72	Good (45.3-72.1)
Tolerance measures			
Beck's community tolerance index	19	86	Excellent (>65.9)
% Nutrient tolerant organisms	24	76	Fair (50.9-76.2)
WMB-I Assessment Score	---	**65**	**Good (57-78)**

WATER CHEMISTRY

Results of water chemistry analyses are presented 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. Total nitrogen and total aluminum concentrations were higher than expected based on the 90th percentile of reference reaches within ecoregion 65f. In situ pH measurements were also slightly acidic, but this a natural condition in this ecoregion.

SUMMARY

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

Bioassessment results indicated the macroinvertebrate community in Puppy Creek at PPYM-1 to be in *good* condition.

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Table 5. Summary of water quality data collected March-October, 2005. 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	Median	Avg	SD
Physical						
Temperature (°C)	9	13.0	25.0	24.0	22.7	3.7
Turbidity (NTU)	9	3.2	51.6	4.2	12.5	16.0
Total Dissolved Solids (mg/L)	8	12.0	79.0	41.5	38.0	21.9
Total Suspended Solids (mg/L)	8	1.0	99.0	7.0	22.4	33.7
Specific Conductance (µmhos)	9	35.1	45.7	38.6	39.3	3.4
Hardness (mg/L)	3	22.0	35.0	28.0	28.3	6.5
Alkalinity (mg/L)	8	< 1.0	16.0	5.6	6.0	4.6
Stream Flow (cfs)	8	10.3	109.5	18.6	31.0	32.9
Chemical						
Dissolved Oxygen (mg/L)	9	7.3	9.5	7.9	8.0	0.6
pH (su)	9	5.2[C]	6.5	6.2	6.0	0.5
Ammonia Nitrogen (mg/L)	8	< 0.010	0.037	0.008	0.014	0.012
Nitrate+Nitrite Nitrogen (mg/L)	8	0.063	0.463	0.250	0.248	0.132
Total Kjeldahl Nitrogen (mg/L)	8	< 0.150	2.400	0.447	0.722	0.728
Total Nitrogen (mg/L)	8	0.331	2.463	0.718[M]	0.970	0.676
Dissolved Reactive Phosphorus (mg/L)	8	0.004	0.011	0.003	0.005	0.004
Total Phosphorus (mg/L)	8	< 0.004	0.189	0.029	0.046	0.060
CBOD-5 (mg/L)	8	< 1.0	1.7	1.4	1.2	0.6
COD (mg/L)	1	2.0	2.0	1.0	1.0	—-
TOC (mg/L)	2	2.3	3.6	3.0	3.0	0.9
Chlorides (mg/L)	5	< 2.0	8.7	3.0	4.0	2.7
Atrazine (µg/L)	1	0.05	0.05	0.03	0.03	—-
Total Metals						
Aluminum (mg/L)	3	0.26	1.5	0.490[M]	0.750	0.660
Iron (mg/L)	3	0.676	2.26	1.04	1.325	0.830
Manganese (mg/L)	3	0.019	0.112	0.038	0.056	0.049
Dissolved Metals						
Aluminum (mg/L)	3	0.120	0.180	0.120	0.140	0.035
Antimony (µg/L)	3	< 7.5	< 7.5	3.8	3.8	0.0
Arsenic (µg/L)	3	< 5	< 5	2.5	2.5	0.0
Cadmium (mg/L)	3	< 0.0003	< 0.0003	0.0001	0.0002	0.0001
Chromium (mg/L)	3	< 0.005	< 0.005	0.003	0.003	0.000
Copper (mg/L)	3	< 0.005	< 0.005	0.003	0.003	0.000
Iron (mg/L)	3	0.145	0.300	0.205	0.217	0.078
Lead (µg/L)	3	< 5	< 5	2.5	2.5	0.0
Manganese (mg/L)	3	0.016	0.083	0.032	0.044	0.035
Mercury (µg/L)	3	< 0.5	< 0.5	0.3	0.3	0.0
Nickel (mg/L)	3	< 0.005	0.014	0.003	0.006	0.007
Selenium (µg/L)	3	< 7.5	< 7.5	3.8	3.8	0.0
Silver (mg/L)	3	< 0.0008	< 0.0008	0.0004	0.0004	0.000
Thallium (µg/L)	3	< 2.5	9	4.5	3.4	1.9
Zinc (mg/L)	3	< 0.005	< 0.005	0.003	0.003	0.000
Biological						
Chlorophyll a (µg/L)	8	0.53	10.68	1.80	3.36	3.68
[J] Fecal Coliform (col/100 mL)	5	120	2000	200	582	801

J=estimate; N= # of samples; M=value >90% of collected samples in ecoregion 65f; C=value exceeds established criteria for *F&W* water use classification.