Alabama Department of Environmental Management

Use Support Assessment Site

Rivers and Streams Monitoring Program

2015 Monitoring Summary

Fair

Puppy Creek at Mobile County Road 21 near mouth (30.98420/-88.40110)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected Puppy Creek at PPYM-1 for biological and water quality monitoring. Puppy Creek was originally listed on Alabama's 303(d) list in 1998, 2000, 2002 and 2004 for nutrients and pathogens. In 2002, ADEM completed a TMDL which addressed pathogens impairment within Puppy Creek and that TMDL was approved by the EPA in 2005. Puppy Creek remains on the 2006 303(d) list for nutrients. The site was also incorporated into ADEM's 2015 assessment of the Escatawpa, Mobile, Perdido and Tombigbee (EMPT) River Basins. Habitat and fish community assessments were conducted on Puppy Creek at PPYM-1 on August 6, 2015 to assess any impacts to biological communities. Monthly water quality sampling was also conducted, March through October, 2015.

Figure 1. Puppy Creek at PPYM-1, June 9, 2015.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Puppy Creek is a *Fish and Wildlife (F&W)* stream located in Mobile County. At PPYM-1, the stream drains approximately 42 square miles to its source in the Escatawpa River. Based on the 2011 National Land Cover Dataset, landuse within the watershed is primarily forest areas (42%). As of April 1, 2016, 13 NPDES outfalls have been issued in this watershed.

REACH CHARACTERISTICS

General observations (Table 2) and a habitat assessment (Table 3) were completed during the fish community 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 low gradient stream located in the Southern Pine Plains & Hills ecoregion (65f) (Figure 1). Benthic substrate in the reach consists primarily of sand with some organic matter. Overall habitat quality was categorized as *sub-optimal* for supporting diverse aquatic macroinvertebrate and fish communities.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Escatawpa R
Drainage Area (mi^2)		42
Ecoregion[a]		65F
% Landuse[b]		
Open water		<1%
Wetland	Woody	15%
	Emergent herbaceous	<1%
Forest	Deciduous	<1%
	Evergreen	35%
	Mixed	7%
Shrub/scrub		19%
Grassland/herbaceous		9%
Pasture/hay		7%
Cultivated crops		1%
Development	Open space	3%
	Low intensity	<1%
	Moderate intensity	<1%
	High intensity	<1%
Barren		<1%
Population/km^2[c]		22
# NPDES Permits[d]	**TOTAL**	13
Construction		7
Industrial Individual		6

a. Southern Pine Plains & Hills

b. 2011 National Land Cover Dataset

c. 2010 US Census

d. #NPDES outfalls downloaded from ADEM's NPDES Management System database, April 1, 2016.

Table 2. Physical characteristics of Puppy Creek at PPYM-1, August 6, 2015.

Physical Characteristics		
Width (ft)		45
Canopy Cover		Estimate 50/50
Depth (ft)		
	Run	1.5
	Pool	2.0
% of Reach		
	Run	80
	Pool	20
% Substrate		
	Sand	60
	Organic Matter	40

Table 3. Results of the habitat assessment conducted on Puppy Creek at PPYM-1, August 6, 2015.

Habitat Assessment	% Maximum Score	Rating
Instream Habitat Quality	**56**	Sub-optimal (55-79)
Sediment Deposition	**63**	Sub-optimal (55-79)
Sinuosity	**73**	Sub-optimal (55-79)
Bank and Vegetative Stability	**64**	Sub-optimal (58-79)
Riparian Buffer	**79**	Sub-optimal (60-84)
Habitat Assessment Score	**118**	
% Maximum Score	**69**	**Sub-optimal (57-80)**

Table 4. Results of the fish community assessment conducted in Puppy Creek at PPYM-1, August 6, 2015.

Fish Community Assessment		
	Results	**Score**
Species Richness & Diversity		
Total native species	17	3
Number shiner species	5	3
Number of sucker species	0	1
Number of centrarchid species	3	1
Number of darter+madtom species	6	5
Tolerance & Intolerance Measures		
Percent of tolerant species	0.47	5
Percent Green Sunfish & Yellow Bullhead	0	5
Trophic Measures		
Percent insectivorous cyprinids	70.42	5
Percent invertivores	29.11	3
Percent top carnivores	1.41	3
Abundance, Condition & Reproductive Measures		
Percent DELT+hybrids	0	5
Number of lithophilic spawners	8	3
IBI Assessment Score		**42**
Condition		**Fair**

BIOASSESSMENT RESULTS

The fish community in Puppy Creek at PPYM-1 was sampled using Alabama's Fish Community Index of Biotic Integrity (AL-IBI), developed through a multi-agency (GSA, ADCNR, ADEM) project to establish a comprehensive fish community bioassessment tool for wadeable streams and rivers across the State. The data collected during this survey were used to score the overall health of the fish community, based on conditions expected for wadeable streams and rivers in the Southern Plains Ichthyoregion. The AL-IBI uses twelve measures of species richness and diversity, tolerance/intolerance, and abundance, condition, and reproduction to assess the overall health of the fish community. The final IBI score is the sum of all individual metrics on a 60 point scale. The IBI score for Puppy Creek at PPYM-1 was 42, indicating the fish community to be in *fair* condition (Table 4).

WATER CHEMISTRY

Results of water chemistry samples are presented in Table 5. In situ measurements and water samples were collected monthly during March through October of 2015 to help identify any stressors to the biological communities. Puppy Creek at PPYM-1 met *F&W* use classification criteria for temperature, turbidity, and dissolved oxygen. Five of the nine pH measurements were below the 6.0 standard unit criteria for *F&W*. However, a slightly acidic pH is not unusual in this stream type. Median specific conductance and turbidity was higher than the value expected based on data collected in ecoregion 65f. Also, median nitrogen concentrations (total kjeldahl nitrogen and total nitrogen) were higher than the expected values based on the 90th percentile of data collected at reference reaches within the Southern Pine Plains & Hills ecoregion.

Table 5. Summary of water quality data collected March-October, 2015. 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)	9	12.6	24.0	19.9	19.6	4.3	
Turbidity (NTU)	9	2.8	208.0	7.1[M]	37.2	66.1	
Total Dissolved Solids (mg/L)	8	31.0	92.0	42.5	49.1	19.1	
[J] Total Suspended Solids (mg/L)	8	1.0	123.0	3.5	32.6	49.6	
Specific Conductance (µmhos/cm@25C)	9	24.1	37.3	32.1[G]	30.5	4.3	
[J] Alkalinity (mg/L)	8	1.6	14.0	4.2	5.5	4.0	
Monthly Stream Flow (cfs)	5	11.4	70.9	27.6	30.6	23.9	
Stream Flow during Sample Collection (cfs)	5	11.4	70.9	27.6	30.6	23.9	
Chemical							
Dissolved Oxygen (mg/L)	9	8.0	11.0	8.7	9.1	1.1	
pH (SU)	9	4.2[C]	7.1	5.8	5.5	0.9	5
[J] Ammonia Nitrogen (mg/L)	8	< 0.024	0.102	0.035	0.043	0.033	
Nitrate+Nitrite Nitrogen (mg/L)	8	0.071	0.493	0.294	0.284	0.153	
[J] Total Kjeldahl Nitrogen (mg/L)	8	0.180	1.700	0.450[M]	0.664	0.524	
[J] Total Nitrogen (mg/L)	8	0.592	1.771	0.742[M]	0.948	0.438	
[J] Dissolved Reactive Phosphorus (mg/L)	8	< 0.003	0.007	0.002	0.004	0.002	
Total Phosphorus (mg/L)	8	0.010	0.054	0.016	0.024	0.016	
[J] CBOD-5 (mg/L)	8	< 2.0	2.0	1.0	1.0	0.0	
[J] Chlorides (mg/L)	8	4.0	5.0	4.5	4.5	0.3	
Atrazine (µg/L)	1				0.14		
Biological							
Chlorophyll a (mg/m³)	8	< 1.00	1.00	0.50	0.56	0.18	
[J] E. coli (MPN/DL)	8	110.0	>72,400[H]	190.0	9236.2	25522.3	1

C=*F&W* criterion violated; E=# samples that exceeded criteria; G=value higher than median concentration of all verified reference data collected in ecoregion 65f; J=estimate; M=value >90% of all verified ecoregional reference reach data collected in the ecoregion 65f; N=# samples.

SUMMARY

Overall habitat quality was categorized as *sub-optimal* for this stream type. Results of ADEM's fish community assessment indicated the fish community to be in *fair* condition. Water quality criteria for pH was not met for its *F&W* use classification five times throughout the sampling season. However, a slightly acidic pH is not unusual in this stream type. Median total kjeldahl nitrogen and total nitrogen were higher than values expected based on data collected at reference reaches within the ecoregion (65f). As part of the assessment process, ADEM will review the monitoring information presented in this report, along with all other available data. Further sampling may be required to ensure that water quality and biological conditions remain stable.

FOR MORE INFORMATION, CONTACT:
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