Alabama Department of Environmental Management

Use Support Assessment Site

Rivers and Streams Monitoring Program

2015 Monitoring Summary

Fair-Good

Pates Creek at Hill Top Road in Houston County (31.19749/-85.68137)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected Pates Creek for biological and water quality monitoring as part of the 2015 Rivers and Streams Monitoring Project. The objectives of this project were to provide data to fully assess each monitoring site and to estimate overall water quality stationwide using habitat and macroinvertebrate surveys and intensive water quality data.

Figure 1. Pates Creek at PTSH-1, May 5, 2015.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Choctawhatchee River
Drainage Area (mi^2)		16
Ecoregion[a]		65G
% Landuse[b]		
Open water		<1%
Wetland	Woody	1%
	Emergent herbaceous	<1%
Forest	Deciduous	6%
	Evergreen	18%
	Mixed	2%
Shrub/scrub		18%
Grassland/herbaceous		<1%
Pasture/hay		17%
Cultivated crops		32%
Development	Open space	4%
	Low intensity	<1%
	Moderate intensity	<1%
	High intensity	<1%
Barren		<1%
Population/km^2[c]		15
# NPDES Permits[d]	**TOTAL**	2
Small Mining		2

a. Dougherty Plain
b. 2011 National Land Cover Dataset
c. 2010 US Census
d. #NPDES outfalls downloaded from ADEM's NPDES Management System database, April 1, 2016.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Pates Creek is a *Fish & Wildlife (F&W)* stream in the Dougherty Plain ecoregion (65g) of Houston County. Based on the 2011 National Land Cover Dataset, land use within the watershed is composed of agriculture, pasture, forest (38%), and shrub/scrub. Population density is low, and less than six percent of the watershed area is developed. As of April 1, 2016, two outfalls are active in this watershed.

Table 2. Physical characteristics of Pates Creek at PTSH-1, May 5, 2015.

Physical Characteristics	
Width (ft)	31
Canopy Cover	Mostly Open
Depth (ft)	
Run	1.0
Pool	1.5
% of Reach	
Run	90
Pool	10
% Substrate	
Gravel	25
Sand	65
Silt	5
Organic Matter	5

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. Pates Creek at PTSH-1 is a low gradient stream characterized by sand and gravel substrates (Figure 1). Instream habitat was limited. Sedimentation was also noted as an issue within the reach.

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 coastal plain 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 Pates Creek at PTSH-1 rated the site as *fair-good*. Relative abundance and numbers of pollution-sensitive taxa wre lower than expected, while relative abundance and numbers of pollution-tolerant taxa have increased (Table 4).

Table 3. Results of the habitat assessment conducted on Pates Creek at PTSH-1, May 5, 2015.

Habitat Assessment	% Maximum Score	Rating
Instream Habitat Quality	48	Marginal (31-<55)
Sediment Deposition	40	Marginal (31-<55)
Sinuosity	73	Sub-Optimal (55-79)
Bank Vegetative Stability	54	Marginal (31-<58)
Riparian Buffer	78	Sub-Optimal (60-84)
Habitat Assessment Score	**104**	
% of Maximum Score	**61**	**Sub-Optimal (57-80)**

Table 4. Results of the macroinvertebrate bioassessment conducted in Pates Creek at PTSH-1, May 5, 2015.

Macroinvertebrate Assessment	
	Results
Taxa richness and diversity measures	
Total # Taxa	51
# EPT taxa	11
# Highly-sensitive and Specialized Taxa	2
Taxonomic composition measures	
% EPC taxa	35
% Trichoptera & Chironomidae Taxa	39
% EP Individuals	14
% Chironomidae Individuals	64
% Individuals in Dominant 5 Taxa	59
Functional feeding group	
% Collector-Filterer Individuals	28
% Tolerant Filterer Taxa	10
Community tolerance	
# Sensitive EPT	5
% Sensitive taxa	25
% Nutrient Tolerant individuals	30
WMB-I Assessment Score	**4+**
WMB-I Assessment Rating	**Fair-Good**

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. *In situ* measurements and water samples were collected monthly or semi-monthly (metals) from March through October of 2015 to help identify any stressors to the biological communities. Turbidity was greater than 50 NTU above the 90th percentile of reference reach data from this ecoregion during a high flow event in April. E. coli counts exceeded single sample human health criterion in five of eight sampling events. Specific conductance, hardness, nitrate-nitrite nitrogen and total nitrogen concentrations were higher than expected based on comparison with reference reach data for streams in the Dougherty Plain ecoregion (65g). Atrazine was above the minimum detection limit (MDL) in April.

SUMMARY

As part of the assessment process, ADEM will review the monitoring information presented in this report, along with all other available data to identify stressors of the biological condition in the reach. The habitat assessment conducted in Pates Creek at PTSH-1 indicated the reach to be *sub-optimal* condition for supporting a diverse biological community. Bioassessment results indicated the macroinvertebrate community in the reach to be in *fair-good* condition. Results of water chemistry analyses showed several physical parameters, nitrogen, atrazine, and E. coli to be present at the site in concentrations higher than expected for streams in ecoregion 65g. Monitoring should continue to ensure that water quality and the biological community remain stable.

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	Q
Physical								
Temperature (°C)	10	18.4	24.4	21.0	21.1	2.1		
Turbidity (NTU)	10	5.4	229.0 T	8.2	31.0	69.6		
Total Dissolved Solids (mg/L)	8	36.0	75.0	50.5	50.5	11.9		
Total Suspended Solids (mg/L)	8	1.0	174.0	7.0	27.6	59.3		
Specific Conductance (µmhos/cm@25C)	10	46.2	64.8	61.6 G	60.4	5.3		
Hardness (mg/L)	4	23.8	26.1	25.2 G	25.0	1.0		
J Alkalinity (mg/L)	8	15.5	22.0	21.2	20.2	2.3		
Monthly Stream Flow (cfs)	10	16.7	69.2	20.1	25.9	15.8		
Stream Flow during Sample Collection (cfs)	10	16.7	69.2	20.1	25.9	15.8		
Chemical								
Dissolved Oxygen (mg/L)	10	7.9	9.3	8.6	8.6	0.4		
pH (SU)	10	6.6	7.0	6.9	6.9	0.1		
J Ammonia Nitrogen (mg/L)	8	< 0.007	0.093	0.008	0.019	0.030		
Nitrate+Nitrite Nitrogen (mg/L)	8	0.447	0.923	0.811 M	0.778	0.146		
Total Kjeldahl Nitrogen (mg/L)	8	< 0.064	0.947	0.368	0.395	0.314		
Total Nitrogen (mg/L)	8	< 0.783	1.568	1.180 M	1.173	0.244		
J Dissolved Reactive Phosphorus (mg/L)	8	0.004	0.010	0.005	0.006	0.002		
Total Phosphorus (mg/L)	8	0.014	0.080	0.016	0.024	0.023		
CBOD-5 (mg/L)	8	< 2.0	< 2.0	1.0	1.0	0.0		
Chlorides (mg/L)	8	3.0	4.1	3.9	3.8	0.4		
Atrazine (µg/L)	1				0.29			
Total Metals								
J Aluminum (mg/L)	4	< 0.106	6.540	0.151	1.724	3.211		
Iron (mg/L)	4	0.923	6.230	0.952	2.264	2.644		
J Manganese (mg/L)	4	0.027	0.292	0.068	0.114	0.123		
Dissolved Metals								
Aluminum (mg/L)	4	< 0.106	0.835	0.053	0.248	0.391		
Antimony (µg/L)	4	< 0.3	< 0.3	0.2	0.2	0.0		
J Arsenic (µg/L)	4	0.3 H	0.5 H	0.4	0.4	0.1		4
Cadmium (µg/L)	4	< 0.311	< 0.311	0.156	0.156	0.000		
J Chromium (mg/L)	4	< 0.347	1.294	0.436	0.585	0.489		
J Copper (mg/L)	4	< 0.218	0.712	0.206	0.308	0.284		
Iron (mg/L)	4	0.401	0.748	0.403	0.489	0.173		
J Lead (µg/L)	4	< 0.4	0.5	0.2	0.3	0.1		
J Manganese (mg/L)	4	0.010	0.087	0.025	0.037	0.035		
J Nickel (mg/L)	4	< 0.460	0.813	0.230	0.376	0.292		
Selenium (µg/L)	4	< 0.4	< 0.4	0.2	0.2	0.0		
Silver (µg/L)	4	< 0.365	< 0.365	0.182	0.182	0.000		
Thallium (µg/L)	4	< 0.5	< 0.5	0.2	0.2	0.0		
J Zinc (mg/L)	4	< 0.522	2.737	0.450	0.975	1.188.		
Biological								
J Chlorophyll a (mg/m³)	8	< 0.10	2.50	0.28	0.52	0.83		
E. coli (MPN/DL)	8	163.2	3972.6 H	376.4	829.7	1282.6	2	

G=value higher than median concentration of all verified ecoregional reference reach data collected in the ecoregion 65g; H=(*F&W*) human health criterion exceeded; M=value>90% of all verifies ecoregional reference reach data collected on the ecoregions 65g; J=estimate; N= # samples; T=value exceeds 50 NTU above the 90th percentile of all verified ecoregional reference reach data collected in the ecoregion 65g; Q= # of uncertain exceedances.

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