

Patrick Creek at Coffee County Road 368 (31.43840/-86.11210)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Patrick Creek watershed for biological and water quality monitoring as part of the 2014 Survey of the Southeastern Alabama River Basins. The objectives of these surveys were to fully assess biological, chemical, and physical conditions within the watershed.



Figure 1. Patrick Creek at PATC-1, September 3, 2014.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Patrick Creek is a small *Fish & Wildlife (F&W)* stream located approximately 3 miles west of Elba in the Choctawhatchee River basin. Based on the 2011 National Land Cover Dataset, land use within the watershed is primarily forest (65%). As of April 1, 2016, there were no NPDES outfalls active in the area.

REACH CHARACTERISTICS

General observations (Table 2) and a habitat assessment (Table 3) were completed during the 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. Patrick Creek at PATC-1 is sand-bottomed, glide-pool stream, typical of creeks in the 65d ecoregion (Figure 1). Overall habitat quality was categorized as *sub-optimal* due to limited instream habitat.

BIOASSESSMENT RESULTS

The fish community in Patrick Creek at PATC-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 average of all individual metrics on a 60 point scale. The IBI score for Patrick Creek at PATC-1 was 36, indicating the fish community to be in *fair* condition (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin	Choctawhatchee River	
Drainage Area (mi²)	9	
Ecoregion^a	65D	
% Landuse^b		
Open water		1%
Wetland	Woody	3%
	Emergent herbaceous	<1%
Forest	Deciduous	14%
	Evergreen	35%
	Mixed	16%
Shrub/scrub		14%
Grassland/herbaceous		3%
Pasture/hay		6%
Cultivated crops		5%
Development	Open space	2%
	Low intensity	<1%
Population/km^{2c}	8	

a. Southern Hilly Gulf Coastal Plain

b. 2011 National Land Cover Dataset

c. 2010 US Census

Table 2. Physical characteristics of Patrick Creek at PATC-1, July 15, 2014.

Physical Characteristics	
Width (ft)	15
Canopy Cover	Shaded
Depth (ft)	
Run	0.5
Pool	1.5
% of Reach	
Run	70
Pool	30
% Substrate	
Sand	73
Silt	2
Organic Matter	25

Table 3. Results of the habitat assessment conducted on Patrick Creek at PATC-1, July 15, 2014..

Habitat Assessment	% Maximum Score	Rating
Instream Habitat Quality	50	Marginal (31-<55)
Sediment Deposition	58	Sub-Optimal (55-79)
Sinuosity	88	Optimal (>79)
Bank Vegetative Stability	64	Sub-Optimal (58-79)
Riparian Buffer	90	Optimal (>84)
Habitat Assessment Score	121	
% of Maximum Score	71	Sub-Optimal (57-80)

Table 4. Results of the fish bioassessment conducted in Patrick Creek at PATC-1, July 15., 2014.

Fish Community Assessment		
	Results	Score
Species Richness & Diversity		
Total native species	17	3
Number shiner species	5	5
Number of sucker species	0	1
Number of centrarchid species	4	3
Number of darter+madtom species	3	3
Tolerance & Intolerance Measures		
Percent of tolerant species	8.72	3
Percent Green Sunfish & Yellow Bullhead	4.1	1
Trophic Measures		
Percent insectivorous cyprinids	69.23	5
Percent invertivores	20	1
Percent top carnivores	0	1
Abundance, Condition & Reproductive Measures		
Percent DELT+hybrids	0	5
Number of lithophilic spawners	11	5
IBI Assessment Score		36
Condition		Fair

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. In situ measurements and water samples were collected monthly, semi-monthly (metals) during March through October of 2014 to help identify any stressors to the biological communities. Median concentrations of nitrate +nitrite-nitrogen and total nitrogen were higher than expected based on reference reach data collected in the Dougherty Plains ecoregion. In addition, E. coli counts exceeded the single sample summer criterion for F&W streams on August 6, 2014.

SUMMARY

Patrick Creek at PATC-1 was sampled as part of the 2014 Survey of the Southeastern Alabama River Basins. Results of the fish survey indicated the community to be in *fair* condition. The habitat assessment indicated conditions to be *sub-optimal* for supporting fish. Median concentrations of nitrate+nitrite-nitrogen and total nitrogen to be higher than expected, and E. coli exceeded single sample summer criterion for F&W streams. Monitoring should continue to ensure that water quality and biological conditions remain stable.

Table 5. Summary of water quality data collected March through October, 2014. 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

Parameter	N	Min	Max	Med	Avg	SD	E	Q
Physical								
Temperature (°C)	9	12.8	24.4	22.9	20.3	4.6		
Turbidity (NTU)	9	6.1	25.4	11.4	12.7	5.8		
Total Dissolved Solids	8	38.0	131.0	57.0	63.4	29.4		
Total Suspended Solids	8 <	1.0	25.0	8.0	9.7	8.5		
Specific Conductance	9	33.5	56.9	54.0	47.9	9.2		
Hardness (mg/L)	4	10.4	18.9	16.1	15.4	4.1		
Alkalinity (mg/L)	8	6.6	14.4	11.5	11.1	2.8		
Monthly Stream Flow (cfs)	9	1.6	34.1	2.0	9.0	10.9		
Measured Stream Flow (cfs)	9	1.6	34.1	2.0	9.0	10.9		
Chemical								
Dissolved Oxygen (mg/L)	9	7.6	10.1	8.1	8.6	0.9		
pH (SU)	9	6.2	7.0	6.9	6.8	0.3		
Ammonia Nitrogen (mg/L)	8 <	0.006	0.041	0.014	0.018	0.016		
Nitrate+Nitrite Nitrogen	8	0.251	0.853	0.592	0.561	0.235		
Total Kjeldahl Nitrogen	8	0.235	1.050	0.502	0.512	0.266		
Total Nitrogen (mg/L)	8	0.846	1.302	1.061	1.072	0.194		
Dis Reactive Phosphorus	8 <	0.003	0.004	0.003	0.002	0.001		
Total Phosphorus (mg/L)	8	0.008	0.029	0.015	0.018	0.008		
CBOD-5 (mg/L)	8 <	2.0	2.0	1.0	1.0	0.0		
COD (mg/L)	8 <	1.6	17.9	7.4	8.6	6.4		
TOC (mg/L)	8	3.0	4.1	3.5	3.5	0.4		
Chlorides (mg/L)	8	3.2	5.9	4.9	4.7	1.1		
Total Metals								
Aluminum (mg/L)	4 <	0.050	0.671	0.152	0.250	0.305		
Iron (mg/L)	4	0.663	1.910	1.374	1.330	0.623		
Manganese (mg/L)	4	0.028	0.060	0.044	0.044	0.016		
Dissolved Metals								
Aluminum (mg/L)	4 <	0.050	0.130	0.025	0.051	0.052		
Antimony (µg/L)	4 <	0.176	0.430	0.088	0.120	0.064		
Arsenic (µg/L)	4 <	0.340	0.610	0.412	0.401	0.180		3
Cadmium (µg/L)	4 <	0.246	0.390	0.123	0.141	0.036		
Chromium (µg/L)	4 <	0.430	1.153	0.690	0.687	0.387		
Copper (µg/L)	4 <	0.270	0.430	0.272	0.277	0.162		
Iron (mg/L)	4	0.377	0.919	0.548	0.598	0.229		
Lead (µg/L)	4 <	0.230	0.540	0.115	0.154	0.078		
Manganese (mg/L)	4	0.018	0.052	0.032	0.034	0.016		
Nickel (µg/L)	4	0.330	0.570	0.410	0.414	0.126		
Selenium (µg/L)	4 <	0.395	0.490	0.198	0.209	0.024		
Silver (µg/L)	4 <	0.252	0.460	0.126	0.152	0.052		
Thallium (µg/L)	4 <	0.233	0.640	0.116	0.167	0.102		
Zinc (µg/L)	4	2.456	13.056	3.445	5.600	5.053		
Biological								
Chlorophyll a (mg/m²)	8 <	0.10	5.93	1.97	2.23	2.20		
E. coli (MPN/DL)	8	155.3	2419.6	293.0	573.5	762.0	1	

H=F&W human health criterion exceeded; J=estimate; M=value > 90% of all data collected within ecoregion 65d; N= # samples; Q=# of samples that it is uncertain if criteria was exceeded.

FOR MORE INFORMATION, CONTACT:

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