

2019 Monitoring Summary

Ecological Reference Reach



South Fork of Panther Creek at Lauderdale County Rd 105(32.96252/-88.11964)

BACKGROUND

South Fork of Panther Creek is among the least-disturbed watersheds within the Transition Hills ecoregion, based on desktop reconnaissance completed in 2018. The Alabama Department of Environmental Management (ADEM) monitored this stream as a candidate “high quality” reference watershed for comparison with other streams within the ecoregion. Data from reference watersheds are used to characterize natural or background conditions expected in different ecoregions throughout the state. South Fork of Panther Creek was sampled in 2019 to provide high-quality reference reach data for Transition Hills streams (65j) which comprise the majority of the watershed.



Figure 1. South Fork of Panther Creek at SFPL-1, April 25, 2019.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. South Fork of Panther Creek is a *Fish and Wildlife (F&W)* stream located in Lauderdale county near Waterloo, Alabama. According to the 2021 National Land Cover Dataset, the watershed is over 87% forested with no permitted outfalls. Only 4% of the watershed has been developed and is sparsely populated.

REACH CHARACTERISTICS

General observations (Figure 1, Table 2) and a habitat survey (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. Like other streams in ecoregion 65j, South Fork of Panther Creek at SFPL-1 is a high gradient stream characterized predominantly by a cobble and gravel substrate. Overall habitat quality was categorized as *sub-optimal* for supporting the biological communities in this stream type due to bank instability.

BIOASSESSMENT RESULTS

The benthic macroinvertebrate community was sampled using ADEM’s Intensive Multi-habitat Bioassessment methodology (WMB-I). Measures of taxonomic richness, community composition and pollution tolerance were used to assess the overall health of the macroinvertebrate community in comparison to conditions expected in north Alabama streams and rivers. Each site is placed in one of six levels ranging from 1, or *natural*, to 6, or *highly altered*. The South Fork of Panther Creek at SFPL-1 is a small stream, with a drainage area of 1.5 sq mi, located within the Transition Hills subecoregion (65j). The condition of the macroinvertebrate community at this site has been rated as *Excellent*, identifying South Fork of Panther Creek at SFPL-1 as a level 2, or near natural site. Taxa richness and diversity are exceptional, with 78 total taxa, 44 sensitive taxa, and 31 EPTs, including eight stonefly taxa. Twenty of the taxa are only found in the most pristine streams in Alabama. (Table 4).

Table 1. Summary of general watershed characteristics: SFPL-1.

Watershed Characteristics	
Basin	Tennessee
Drainage Area (mi ²)	1.5
Ecoregion ^a	65j
Assessment Unit	AL06030005-1202-810
Use Class	F&W
AU Category	3
12-digit Hydrologic Unit Code (HUC)	60300051202
Landuse Categories (2021 National Land Cover Dataset)	
Wetland, Total (%)	1.6
Wetlands, Woody (%)	1.6
Forested, Total (%)	87.5
Forested, Deciduous (%)	51.8
Forested, Evergreen (%)	29.2
Forested, Mixed (%)	6.4
Shrub/Scrub (%)	6.1
Grassland/Herbaceous (%)	0.2
Pasture/Hay (%)	0.5
Developed, Total (%)	4.1
Developed, Open Space (%)	4.1
Developed, Low Intensity (%)	0.1
Population/km (2020 US Census Data)	11.1

^a Transition Hills

Table 2. Physical characteristics of South Fork Panther Creek at SFPL-1, April 25, 2019.

Physical Characteristics	
Width (ft)	8
Canopy Cover	Shaded
Depth (ft)	
Riffle	0.3
Run	1.0
Pool	2.0
% of Reach	
Riffle	45
Run	45
Pool	10
% Substrate	
Bedrock	7
Boulder	5
Cobble	40
Gravel	35
Sand	8
Organic Matter	5

Table 3. Results of the habitat assessment survey conducted on South Fork Panther Creek at SFPL-1, April 25, 2019.

Habitat Survey	% Max Score	Rating
Instream Habitat Quality	77	Sub-optimal/Optimal (75-79.999)
Sediment Deposition	65	Sub-optimal (55-74.999)
Riffle Frequency	80	Optimal (80-100)
Bank Vegetative Stability	36	Marginal (30-49.999)
Riparian Zone Measurements	90	Optimal (80-100)
Habitat Assessment Score	139	
% Maximum Score	69	Sub-optimal (55-69.999)

Table 4. Results of the macroinvertebrate survey conducted on South Fork Panther Creek at SFPL-1, April 25, 2019.

Macroinvertebrate Assessment	Results	Scores
Taxonomic richness and diversity metrics		
Taxa Count	78	78
# rare and highly sensitive taxa	20	20
# sensitive taxa	44	44
# sensitive EPT taxa	22	22
Percent taxon metrics		
% rare and highly sensitive taxa	26	26
% sensitive taxa	56	56
% sensitive EPT taxa	28	28
% highly tolerant taxa	4	4
Percent individual metrics		
% rare and highly sensitive individuals	22	22
% sensitive individuals	44	44
% sensitive EPT individuals	17	17
% tolerant individuals	12	12
WMB-I Survey Score		2.0
WMB-I Survey Rating		Excellent (2-2.149)

WATER CHEMISTRY

Results of water chemistry analyses are summarized in Table 5. In situ measurements and water samples were collected monthly and semi-monthly (metals), from March through October 2019 to help characterize the reach. An individual *E. coli* count exceeded the human health criterion for the *F&W* use classification during the August sampling event. During the same sampling event, individual pH values violated the < 6.0 SU *F&W* aquatic life use criterion. Field observations during the August sampling event indicates the watershed experienced rain events during the previous seven days and within 24 hours of sampling. An individual ammonia nitrogen value was greater than ninety percent of ecoregional reference guidelines during the march sampling event.

SUMMARY

The ADEM monitored South Fork of Panther Creek at SFPL-1 as a candidate “high-quality” reference reach for comparison with other Transition Hills streams. Like other streams in ecoregion 65j, South Fork of Panther Creek at SFPL-1 is a high gradient stream characterized predominantly by a cobble and gravel substrate. Overall habitat quality was categorized as *sub-optimal* for supporting the biological communities in this stream type due to bank stability. Individual *E. coli* count exceeded the human health criterion for the *F&W* use classification during one sampling event. An individual pH value violated the < 6.0 SU aquatic life use criterion. Biological survey results indicate the macroinvertebrate community to be in *excellent* condition.

Table 5. Summary of water quality data collected March through October, 2019. 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.

SFPL-1 AL06030005-1202-810	N	Min	Max	Med	Avg	SD	E	10thP	90thP
Physical									
Temperature (°C)	9	10.1	22.0	16.1	17.3	4.0		10.1	22.0
Turbidity (NTU)	9	2.2	7.4	3.1	3.8	1.9		2.2	7.4
Total Dissolved Solids (mg/L)	7	13.0	30.0	22.0	22.0	5.1		13.0	30.0
Total Suspended Solids (mg/L)	7	<1.0	2.0	1.0	0.9	0.5		0.5	2.0
Specific Conductance (µmhos/cm)	9	13.4	17.0	15.0	15.2	1.2		13.4	17.0
Hardness (mg/L)	4	2.6	3.9	3.1	3.2	0.5		2.6	3.9
Alkalinity (mg/L)	8	<2.5	4.0	3.1	2.8	1.1		1.2	4.0
Measured Stream Flow (cfs)	8	0.5	5.0	1.8	1.9	1.4		0.5	5.0
Chemical									
Dissolved Oxygen (mg/L)	9	8.1	11.9	9.3	9.4	1.2		8.1	11.9
pH (SU)	9	5.8 ^c	6.8	6.5	6.4	0.3	1	5.8	6.8
Ammonia Nitrogen (mg/L)	8	<0.004	0.059 ^d	0.008	0.016	0.020		0.002	0.059
Nitrate+Nitrite Nitrogen (mg/L)	8	0.008	0.080	0.035	0.040	0.023		0.008	0.080
Total Kjeldahl Nitrogen (mg/L)	8	<0.075	0.434	0.248	0.226	0.180		0.038	0.434
Total Nitrogen (mg/L)	8	<0.072	0.443	0.274	0.266	0.171		0.072	0.443
Dis Reactive Phosphorus (mg/L)	8	<0.006	<0.006	0.003	0.003	0.000		0.003	0.003
Total Phosphorus (mg/L)	8	<0.006	0.012	0.004	0.006	0.003		0.003	0.012
TOC (mg/L)	8	0.8	2.7	1.1	1.3	0.6		0.8	2.7
CBOD-5 (mg/L)	8	<2.0	<2.0	1.0	1.0	0.0		1.0	1.0
COD (mg/L)	6	<1.2	7.0	2.3	3.1	2.9		0.6	7.0
Chlorides (mg/L)	8	0.8	1.3	0.9	1.0	0.2		0.8	1.3
Sulfate (mg/L)	8	1.19	4.47	2.16	2.44	1.07		1.19	4.47
Total Metals									
Aluminum (T) (mg/L)	4	0.045	0.230	0.168	0.153	0.088		0.045	0.230
Iron (T) (mg/L)	4	0.121	0.281	0.144	0.172	0.073		0.121	0.281
Manganese (T) (mg/L)	4	<0.004	<0.004	0.002	0.002	0.000		0.002	0.002
Dissolved Metals									
Aluminum (mg/L)	4	<0.023	0.072	0.034	0.038	0.025		0.012	0.072
Antimony (µg/L)	4	<1.480	<1.480	0.740	0.740	0.000		0.740	0.740
Arsenic (µg/L)	4	<0.689	<0.689	0.344	0.344	0.000		0.344	0.344
Cadmium (µg/L)	4	<0.726	<0.726	0.363	0.363	0.000		0.363	0.363
Chromium (µg/L)	4	<0.793	<0.793	0.396	0.396	0.000		0.396	0.396
Copper (µg/L)	4	<1.190	<1.190	0.595	0.595	0.000		0.595	0.595
Iron (mg/L)	4	<0.063	0.067	0.032	0.040	0.018		0.032	0.067
Lead (µg/L)	4	<0.697	<0.697	0.348	0.348	0.000		0.348	0.348
Manganese (mg/L)	4	<0.004	<0.004	0.002	0.002	0.000		0.002	0.002
Nickel (µg/L)	4	<1.960	<1.960	0.980	0.980	0.000		0.980	0.980
Selenium (µg/L)	4	<1.900	<1.900	0.950	0.950	0.000		0.950	0.950
Silver (µg/L)	4	<1.350	<1.350	0.675	0.675	0.000		0.675	0.675
Thallium (µg/L)	4	<0.641	<0.641	0.320	0.320	0.000		0.320	0.320
Zinc (µg/L)	4	<2.340	2.420	1.170	1.482	0.625		1.170	2.420
Biological									
Chlorophyll a (mg/m³)	8	<0.27	1.34	0.50	0.58	0.32		0.27	1.34
<i>E. coli</i> (MPN/DL)	8	10.7	325.5 ^d	135.4	160.9	121.8	1	10.7	325.5

C=F&W criterion violated ; E=# samples that exceeded criteria; H=F&W human health criterion exceeded; D= an individual value >90% of all verified ecoregional reference reach data collected in ecoregion 65j; J=estimate; N=# samples.

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