

2019 Monitoring Summary

Ecological Reference Reach



Larkin Fork at Jackson County Road 27 (34.92861/-86.21998)

BACKGROUND

Larkin Fork is among the least-disturbed watersheds within the Plateau Escarpment ecoregion, based on landuse, road density, and population density. Larkin Fork, is being monitored by the Alabama Department of Environmental Management (ADEM) 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. Larkin Fork was sampled in 2019 to provide high-quality reference reach data for Tennessee Valley streams.

Larkin Fork is within one of 50 Strategic Habitat Units (SHU) by the U.S. Fish and Wildlife Service (USFWS) and the Alabama Rivers & Streams Network (ARSN). SHUs are recognized as high quality habitats occupied by federally listed and state imperiled species.



Figure 1. Larkin Fork at LRKJ-2, May 1, 2019.

Table 1. Summary of general watershed characteristics: LRKJ-2 (2018)

Watershed Characteristics	
Basin	Tennessee
Drainage Area (mi²)	24.8
Ecoregion^o	68c
Assessment Unit	AL06030002-0102-100
Use Class	
AU Category	
12-digit Hydrologic Unit Code (HUC)	060300020102
Conservation Status	
Strategic Habitat Unit †	9 Paint Rock River
Landuse Categories (2011 National Land Cover Dataset)	
Forested, Total (%)	89.3
Forested, Deciduous (%)	84.5
Forested, Evergreen (%)	2.4
Forested, Mixed (%)	2.5
Shrub/Scrub (%)	2.4
Grassland/Herbaceous (%)	0.6
Pasture/Hay (%)	6.2
Crops, Cultivated (%)	0.3
Developed, Total (%)	1.2
Developed, Open Space (%)	1.2
Population/km (2010 US Census)	2
Roads	
Road Density	0.8
# Road Crossings per Stream km	0.5
Watershed Disturbance Score*	43
Watershed Disturbance Category*	2

^o Plateau Escarpment

† 12-digit HUC located in a Strategic Habitat Unit.

* Measure of watershed disturbance based on landuse, population, and road density summarized in this table.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Larkin Fork is a *Fish and Wildlife (F&W)* stream located in Jackson county near Larkin, Alabama. According to the 2011 National Land Cover Dataset, the watershed is over 89% forested with no permitted outfalls. It is very sparsely populated with very few roads. It is located within a Strategic Habitat Unit that supports federally listed threatened or endangered aquatic species and other aquatic species listed to be of the *Highest or High Conservation Concern* by the state of Alabama.

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 68c, Larkin Fork at LRKJ-2 is a medium-high gradient stream characterized predominantly by a boulder, cobble and gravel substrate. Overall habitat quality was categorized as *sub-optimal/optimal* for supporting the biological communities in this stream type.

BIOASSESSMENT RESULTS

The fish community in Brushy Creek at BRSL-3 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 to score the overall health of the fish community, based on conditions expected for wadeable streams and rivers in the Tennessee Valley 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 Larkin Fork at LRKJ-2 was 52, indicating the fish community to be in *Excellent* condition (Table 4).

Table 2. Physical characteristics of Larkin Fork at LRKJ-2, May 16, 2019.

Physical Characteristics	
Width (ft)	35
Canopy Cover	Mostly Shaded
Depth (ft)	
Riffle	0.8
Run	1.5
Pool	3.0
% of Reach	
Riffle	30
Run	40
Pool	30
% Substrate	
Bedrock	5
Boulder	10
Clay	2
Cobble	35
Gravel	30
Sand	5
Organic Matter	13

Table 3. Results of the habitat assessment survey conducted on Larkin Fork at LRKJ-2, May 16, 2019.

Habitat Survey	% Max Score	Rating
Instream Habitat Quality	86	Optimal (80-100)
Sediment Deposition	83	Optimal (80-100)
Riffle Frequency	70	Sub-optimal (55-74.999)
Bank Vegetative Stability	68	Sub-optimal (55-74.999)
Riparian Zone Measurements	68	Sub-optimal (55-74.999)
Habitat Assessment Score	153	
% Maximum Score	76	Sub-optimal/Optimal (70-84.999)

Table 4. Results of the Fish survey conducted on Larkin Fork at LRKJ-2, May 16, 2019.

Fish Assessment	Results	Scores
Taxonomic richness and diversity metrics		
Total Native Species	31	5
Number of shiner species	6	5
Number of Sucker Species	2	3
Number of darter+madtom species	10	5
Tolerance metrics		
Number of intolerant species	6	5
Percent of tolerant species	24	3
Percent Lepomis	1	5
Trophic metrics		
Percent invertivores	3	5
Percent omnivores	6	5
Percent top carnivores	0	1
Abundance, condition, and reproductive metrics		
Percent DELT+hybrids	0	5
Number of lithophilic spawners	21	5
IBI Survey Score		52
IBI Survey Rating		Excellent

WATER CHEMISTRY

Results of water chemistry are presented in Table 5. In situ measurements and water samples were collected monthly from March to September of 2019 to help identify any stressors to the biological communities.

Dissolved oxygen exceeded the criterion established for the *F&W* water use classification. Median specific conductance, alkalinity, hardness, ammonia, nitrate-nitrite nitrogen, total nitrogen values were higher than the median concentration of all verified ecoregional reference reach data collected in ecoregion 68c. *E. coli* exceeded the *F & W* human health criteria during one sampling event.

SUMMARY

The ADEM monitors Larkin Fork at LRKJ-2 as a candidate “high-quality” reference reach for comparison with other Plateau Escarpment streams. Larkin Fork at LRKJ-2 is typical of streams in the region, characterized by moderate to high gradient riffles with boulder, bed-rock, cobble and gravel substrates. Dissolved oxygen and pH exceeded the criterion established for the *F&W* water use classification. Median specific conductance, alkalinity, hardness, ammonia, nitrate-nitrite nitrogen, total nitrogen values were higher than the median concentration of all verified ecoregional reference reach data collected in ecoregion 68c. Dissolved oxygen exceeded the *F&W* aquatic life use criteria and *E. coli* exceeded the human health criteria for one sampling event. The fish community was found to be in *excellent* condition.

Table 5. Summary of water quality data collected March through September 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.

LRKJ-2	AL06030002-0102-100	N	Min	Max	Med	Avg	SD	E	10thP	90thP
Physical										
Temperature (°C)		9	10.3	23.3	20.1	18.4	4.5		10.3	23.3
Turbidity (NTU)		9	0.8	2.4	1.6	1.8	0.5		0.8	2.4
Total Dissolved Solids (mg/L)		6	165.0	255.0	203.0	205.5	30.8		165.0	255.0
Total Suspended Solids (mg/L)		6	<1.0	4.0	2.0	2.1	1.3		0.5	4.0
Specific Conductance (µmhos/cm)		9	294.0	408.0	359.0 ^G	352.5	33.2		294.0	408.0
Hardness (mg/L)		3	168.0	199.0	182.0 ^G	183.0	15.5		168.0	199.0
Alkalinity (mg/L)		7	147.0	191.0	177.0 ^M	172.4	14.6		147.0	191.0
Measured Stream Flow (cfs)		8	0.6	86.5	6.8	18.2	28.9		0.6	86.5
Chemical										
Dissolved Oxygen (mg/L)		9	4.8 ^C	13.8	7.6	8.7	2.9	1	4.8	13.8
pH (SU)		9	7.4 ^D	8.2 ^D	7.8	7.8	0.2		7.4	8.2
Ammonia Nitrogen (mg/L)		7	<0.004	0.057 ^D	0.009	0.021	0.022		0.002	0.057
Nitrate+Nitrite Nitrogen (mg/L)		7	0.129	0.718	0.367 ^M	0.375	0.210		0.129	0.718
Total Kjeldahl Nitrogen (mg/L)		7	<0.075	2.790	0.161	0.553	1.003		0.038	2.790
Total Nitrogen (mg/L)		7	<0.166	3.028	0.756 ^M	0.928	0.964		0.166	3.028
Dis Reactive Phosphorus (mg/L)		7	0.008	0.021	0.012	0.012	0.005		0.008	0.021
Total Phosphorus (mg/L)		7	0.013	0.032	0.022	0.021	0.007		0.013	0.032
TOC (mg/L)		7	1.0	1.6	1.3	1.3	0.2		1.0	1.6
CBOD-5 (mg/L)		7	<2.0	<2.0	1.0	1.0	0.0		1.0	1.0
COD (mg/L)		7	<1.2	19.6	2.7	4.7	6.8		0.6	19.6
Chlorides (mg/L)		7	1.0	1.6	1.2	1.2	0.2		1.0	1.6
Sulfate (mg/L)		7	5.74	18.20	12.90	11.96	4.01		5.74	18.20
Total Metals										
Aluminum (T) (mg/L)		3	<0.023	0.069	0.038	0.040	0.029		0.012	0.069
Iron (T) (mg/L)		3	<0.063	<0.063	0.032	0.032	0.000		0.032	0.032
Manganese (T) (mg/L)		3	<0.004	<0.004	0.002	0.002	0.000		0.002	0.002
Dissolved Metals										
Aluminum (mg/L)		3	<0.023	0.039	0.012	0.021	0.016		0.012	0.039
Antimony (µg/L)		3	<1.480	<1.480	0.740	0.740	0.000		0.740	0.740
Arsenic (µg/L)		3	<0.689	<0.689	0.344	0.344	0.000		0.344	0.344
Cadmium (µg/L)		3	<0.726	<0.726	0.363	0.363	0.000		0.363	0.363
Chromium (µg/L)		3	<0.793	<0.793	0.396	0.396	0.000		0.396	0.396
Copper (µg/L)		3	<1.190	<1.190	0.595	0.595	0.000		0.595	0.595
Iron (mg/L)		3	<0.063	<0.063	0.032	0.032	0.000		0.032	0.032
Lead (µg/L)		3	<0.697	<0.697	0.348	0.348	0.000		0.348	0.348
Manganese (mg/L)		3	<0.004	<0.004	0.002	0.002	0.000		0.002	0.002
Nickel (µg/L)		3	<1.960	<1.960	0.980	0.980	0.000		0.980	0.980
Selenium (µg/L)		3	<1.900	<1.900	0.950	0.950	0.000		0.950	0.950
Silver (µg/L)		3	<1.350	<1.350	0.675	0.675	0.000		0.675	0.675
Thallium (µg/L)		3	<0.641	<0.641	0.320	0.320	0.000		0.320	0.320
Zinc (µg/L)		3	<2.340	<2.340	1.170	1.170	0.000		1.170	1.170
Biological										
Chlorophyll a (mg/m³)		7	<0.53	8.54	0.50	1.70	3.02		0.50	8.54
<i>E. coli</i> (MPN/DL)		7	57.3	547.5 ^H	126.7	227.3	187.6	1	57.3	547.5

C=*F&W* criterion violated; D=an individual value >90% of all verified ecoregional reference reach data collected in the ecoregion 678c E=# samples that exceeded criteria; G= value higher than median concentration of all verified ecoregional reference reach data collected in the ecoregion 68c; J=estimate; M=value >90% of all verified ecoregional reference reach data collected in the ecoregion 68c; H=*F&W* human health criterion exceeded; N=# samples.

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