Alabama Department of Environmental Management

Ecological Reference Reach

Rivers and Streams Monitoring Program

# 2019 Monitoring Summary

Fair-Good

## Mulberry Creek at Covington County Road 85 (31.18484/-86.33515)

### BACKGROUND

Mulberry Creek is among the least-disturbed watersheds within the Dougherty Plains ecoregion, based on landuse, road density, and population density. Mulberry 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. Mulberry Creek was sampled in 2019 to provide high-quality reference reach data for Dougherty Plains streams.

Mulberry Creek 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**. Mulberry Ck at MLRC-1, April 24, 2019.

**Table 1. Summary of general watershed characteristics: MLRC-1 (2018)**

| Watershed Characteristics | |
|---|---|
| **Basin** | Yellow |
| **Drainage Area (mi²)** | 4.2 |
| **Ecoregion°** | 65g |
| **Assessment Unit** | AL03140103-0301-200 |
| **Use Class** | |
| **AU Category** | |
| **12-digit Hydrologic Unit Code (HUC)** | 031401030202 |
| **Conservation Status** | |
| Strategic Habitat Unit † | 45 Five Runs Creek |
| **Landuse Categories (2011 National Land Cover Dataset)** | |
| Wetland, Total (%) | 0.8 |
| Wetlands, Woody (%) | 0.8 |
| Forested, Total (%) | 58.5 |
| Forested, Deciduous (%) | 8.0 |
| Forested, Evergreen (%) | 32.9 |
| Forested, Mixed (%) | 17.5 |
| Shrub/Scrub (%) | 13.4 |
| Grassland/Herbaceous (%) | 9.9 |
| Pasture/Hay (%) | 9.1 |
| Crops, Cultivated (%) | 3.5 |
| Developed, Total (%) | 4.9 |
| Developed, Open Space (%) | 4.2 |
| Developed, Low Intensity (%) | 0.6 |
| **Population/km (2010 US Census)** | 3 |
| **Roads** | |
| Road Density | 1.6 |
| # Road Crossings per Stream km | 0.5 |
| **Watershed Disturbance Score*** | **104** |
| **Watershed Disturbance Category*** | **4** |

° Dougherty Plains

† 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. Mulberry Creek is a *Fish and Wildlife (F&W)* stream located in Covington county near Opp, Alabama. According to the 2011 National Land Cover Dataset, the watershed is over 58% forested with areas of shrub/scrub, grasslands and pasture 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.

**Table 2.** Physical characteristics of Mulberry Creek at MLRC-1, April 24, 2019.

| Physical Characteristics | |
|---|---|
| **Width (ft)** | 15 |
| **Canopy Cover** | Mostly Shaded |
| **Depth (ft)** | |
| Run | 0.5 |
| Pool | 3.0 |
| **% of Reach** | |
| Run | 60 |
| Pool | 40 |
| **% Substrate** | |
| Sand | 80 |
| Silt | 8 |
| Organic Matter | 12 |

### 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 65g, Mulberry Creek at MLRC-1 is a low gradient stream characterized predominantly by a sand substrate. Overall habitat quality was categorized as *marginal/sub-optimal* for supporting the biological communities in this stream type.

### 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*. Mulberry Ck at MLRC-1 was sampled in 2019 as a candidate reference reach for riverine wetlands in Ecoregion 65g. It is located in the Five Runs Creek SHU (45). The macroinvertebrate rating of "*fair-good*" is tentative and conservative, as a primary goal of this project is to calibrate water quality, habitat, and biological conditions to baseline, natural conditions expected in riverine wetlands. In addition to habitat and macroinvertebrate surveys and monthly water quality, a floristic survey, a rapid wetland assessment, and an amphibian survey were also conducted. (Table 4).

**Table 3.** Results of the habitat assessment survey conducted on Mulberry Creek at MLRC-1, April 24, 2019.

| Habitat Survey | % Max Score | Rating |
|---|---|---|
| Instream Habitat Quality | 41 | Marginal (30-49.999) |
| Sediment Deposition | 43 | Marginal (30-49.999) |
| Sinuosity | 50 | Marginal/Sub-optimal (50-54.999) |
| Bank Vegetative Stability | 56 | Sub-optimal (55-74.999) |
| Riparian Zone Measurements | 76 | Sub-optimal/Optimal (75-79.999) |
| **Habitat Assessment Score** | **96** | |
| **% Maximum Score** | **53** | **Marginal/Sub-optimal (40-54.999)** |

**Table 4.** Results of the Macroinvertebrate survey conducted on Mulberry Creek at MLRC-1, April 24, 2019.

| Macroinvertebrate Assessment | Results | Scores |
|---|---|---|
| **Taxonomic richness and diversity metrics** | | |
| Taxa Count | 47 | 47 |
| # rare and highly sensitive taxa | 2 | 2 |
| # sensitive taxa | 14 | 14 |
| # sensitive EPT taxa | 6 | 6 |
| **Percent taxon metrics** | | |
| % rare and highly sensitive taxa | 4 | 4 |
| % sensitive taxa | 30 | 30 |
| % sensitive EPT taxa | 13 | 13 |
| % highly tolerant taxa | 9 | 9 |
| **Percent individual metrics** | | |
| % rare and highly sensitive individuals | 1 | 1 |
| % sensitive individuals | 13 | 13 |
| % sensitive EPT individuals | 6 | 6 |
| % tolerant individuals | 5 | 5 |
| **WMB-I Survey Score** | | **3.5** |
| **WMB-I Survey Rating** | | **Fair-good (3.5-3.849)** |

## WATER CHEMISTRY

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

Median ammonia nitrogen values were higher than the median concentration of all verified ecoregional reference reach data collected in ecoregion 65g. E. coli exceeded the *F&W* human health criteria for one sampling event.

## SUMMARY

The ADEM monitored Mulberry Creek at MLRC-1 as a candidate "high-quality" reference reach for comparison with other Plateau Dougherty Plains streams. Mulberry Creek at MLRC-1 is typical of streams in the region, characterized by a low gradient with predominantly sand substrates. Median ammonia nitrogen values were higher than the median concentration of all verified ecoregional reference reach data collected in ecoregion 65g. E. coli exceeded the *F&W* human health criteria for one sampling event. The macroinvertebrate rating of "*fair-good*" is tentative and conservative, as a primary goal of this project is to calibrate water quality, habitat, and biological conditions to baseline, natural conditions expected in riverine wetlands.

**Table 5.** Summary of water quality data collected March, April, May, June, and 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.

| | MLRC-1 AL03140103-0301-200 | N | Min | Max | Med | Avg | SD | Q | 10thP | 90thP |
|---|---|---|---|---|---|---|---|---|---|---|
| | **Physical** | | | | | | | | | |
| | Temperature (°C) | 6 | 12.5 | 25.4 | 18.6 | 19.4 | 5.1 | | 12.5 | 25.4 |
| | Turbidity (NTU) | 10 | 4.9 | 20.9 | 6.5 | 8.7 | 5.5 | | 5.0 | 18.5 |
| | Total Dissolved Solids (mg/L) | 5 | <1.0 | 32.0 | 26.0 | 20.7 | 13.1 | | 0.5 | 32.0 |
| | Total Suspended Solids (mg/L) | 5 | 1.0 | 4.0 | 3.0 | 2.4 | 1.3 | | 1.0 | 4.0 |
| | Specific Conductance (µmhos/cm) | 6 | 25.8 | 35.6 | 30.8 | 30.7 | 4.2 | | 25.8 | 35.6 |
| | Hardness (mg/L) | 3 | 9.0 | 13.4 | 10.0 | 10.8 | 2.3 | | 9.0 | 13.4 |
| | Alkalinity (mg/L) | 5 | 5.8 | 10.0 | 7.9 | 7.7 | 1.7 | | 5.8 | 10.0 |
| | Color (CU) | 5 | 32 | 90 | 48 | 60 | 24 | | 32 | 90 |
| | Measured Stream Flow (cfs) | 8 | 0.0 | 6.5 | 2.0 | 2.4 | 2.4 | | 0.0 | 6.5 |
| | **Chemical** | | | | | | | | | |
| | Dissolved Oxygen (mg/L) | 6 | 5.3 | 9.9 | 8.3 | 7.9 | 1.6 | | 5.3 | 9.9 |
| | pH (SU) | 6 | 6.2 | 6.7 | 6.2 | 6.3 | 0.2 | | 6.2 | 6.7 |
| J | Ammonia Nitrogen (mg/L) | 5 | <0.004 | 0.032[D] | 0.008 | 0.016 | 0.014 | | 0.002 | 0.032 |
| J | Nitrate+Nitrite Nitrogen (mg/L) | 5 | <0.003 | 0.039 | 0.013 | 0.016 | 0.014 | | 0.002 | 0.039 |
| J | Total Kjeldahl Nitrogen (mg/L) | 5 | <0.109 | 2.340 | 0.175 | 0.614 | 0.970 | | 0.100 | 2.340 |
| J | Total Nitrogen (mg/L) | 5 | <0.102 | 2.358 | 0.188 | 0.630 | 0.971 | | 0.102 | 2.358 |
| | Dis Reactive Phosphorus (mg/L) | 5 | <0.005 | 0.005 | 0.002 | 0.002 | 0.000 | | 0.002 | 0.002 |
| J | Total Phosphorus (mg/L) | 5 | 0.008 | 0.017 | 0.011 | 0.011 | 0.003 | | 0.008 | 0.017 |
| | TOC (mg/L) | 5 | 4.8 | 7.5 | 7.1 | 6.7 | 1.1 | | 4.8 | 7.5 |
| J | Dissolved Organic Carbon (mg/L) | 5 | 4.8 | 8.6 | 6.4 | 6.7 | 1.4 | | 4.8 | 8.6 |
| J | CBOD-5 (mg/L) | 5 | <2.0 | <2.0 | 1.0 | 1.0 | 0.0 | | 1.0 | 1.0 |
| | COD (mg/L) | 5 | 14.1 | 25.3 | 20.9 | 20.5 | 5.0 | | 14.1 | 25.3 |
| | Chlorides (mg/L) | 5 | 2.5 | 3.2 | 3.0 | 3.0 | 0.2 | | 2.5 | 3.2 |
| J | Sulfate (mg/L) | 5 | 0.38 | 1.35 | 0.48 | 0.73 | 0.44 | | 0.38 | 1.35 |
| | **Total Metals** | | | | | | | | | |
| J | Aluminum (T) (mg/L) | 3 | 0.117 | 0.245 | 0.174 | 0.179 | 0.064 | | 0.117 | 0.245 |
| | Iron (T) (mg/L) | 3 | 0.598 | 1.030 | 0.802 | 0.810 | 0.216 | | 0.598 | 1.030 |
| | Manganese (T) (mg/L) | 3 | <0.004 | <0.004 | 0.002 | 0.002 | 0.000 | | 0.002 | 0.002 |
| | **Dissolved Metals** | | | | | | | | | |
| J | Aluminum (mg/L) | 3 | 0.024 | 0.097 | 0.086 | 0.069 | 0.039 | | 0.024 | 0.097 |
| | 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 | 0.361 | 0.512 | 0.473 | 0.449 | 0.078 | | 0.361 | 0.512 |
| | Lead (µg/L) | 3 | <0.697 | <0.697 | 0.348 | 0.348 | 0.000 | | 0.348 | 0.348 |
| | Manganese (mg/L) | 2 | <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) | 5 | <1.00 | 3.20 | 1.07 | 1.70 | 1.16 | | 0.50 | 3.20 |
| J | E. coli (MPN/DL) | 5 | 88.2 | >2419.6[H] | 193.5 | 611.1 | 1012.4 | 1 | 88.2 | 2419.6 |

D=an individual value >90% of all verified ecoregional reference reach data collected in the ecoregion 67f; Q=# of uncertain exceedances; J=estimate; H=*F&W* human health criterion exceeded; N=# samples.

FOR MONITORING INFORMATION, CONTACT:
Brien Diggs, ADEM Environmental Indicators Section
1350 Coliseum Boulevard, Montgomery AL 36109
(334) 260-2750; LOD@adem.alabama.gov