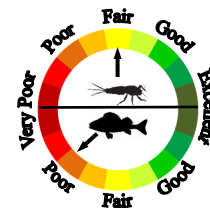


2019 Monitoring Summary

Use Support Assessment Site



Beaverdam Creek upstream of Toyota Plant construction (34.68869/-86.82832)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected Beaverdam Creek for biological and water quality monitoring as part of the 2019 Use Support Assessment Monitoring Program. Beaverdam Creek at BVDL-21 was selected in order to evaluate whether the creek was meeting its *F&W* use classification. Habitat, macroinvertebrate, and fish community surveys were conducted to assess the health of the biological communities within Beaverdam Creek. Monthly water quality sampling was also conducted from March through October, 2019.

In addition, Beaverdam Creek is within the Limestone Creek Strategic Habitat Unit (SHU), one of 50 identified 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. Beaverdam Creek at BVDL-21, May 9, 2019.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Beaverdam Creek is a *Fish and Wildlife (F&W)* stream located in Limestone County. According to the 2021 National Land Cover Dataset, the watershed is over 38% developed and over 46% farm land with 98 permitted outfalls. It is moderately populated with extensive road crossings. It is located within a Strategic Habitat Unit that supports several federally listed threatened and endangered aquatic species that are also of High or Highest 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. Beaverdam Creek at BVDL-21 is a medium-high gradient stream characterized predominantly by a cobble and gravel substrate. Overall habitat quality was categorized as *marginal* for supporting the biological communities in this stream type, due to high sediment deposition, a lack of riffle habitat, and a small riparian buffer zone.

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*. Macroinvertebrate survey results indicated the community to be in *fair* condition. Seventy-seven total taxa were collected. However, only one highly sensitive taxon, and 13 sensitive taxa were collected. Filter-feeders comprised 45% of organisms collected. Thirty-two percent of collected taxa were classified as tolerant (Table 4a).

The fish community in Beaverdam Creek at BVDL-21 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 Plateau 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 Beaverdam Creek at BVDL-21 was 28, indicating the fish community to be in *Poor* condition (Table 4b).

Table 1. Summary of general watershed characteristics: BVDL-21.

Watershed Characteristics	
Basin	Tennessee
Drainage Area (mi ²)	11.4
Ecoregion ^a	71g
Assessment Unit	AL06030002-0905-100
Use Class	F&W
AU Category	3
12-digit Hydrologic Unit Code (HUC)	60300020905
Conservation Status	
Strategic Habitat Unit †	6 Limestone Creek
Landuse Categories (2021 National Land Cover Dataset)	
Open Water (%)	0.3
Wetland, Total (%)	6.3
Wetlands, Woody (%)	6.3
Forested, Total (%)	7.4
Forested, Deciduous (%)	6.0
Forested, Evergreen (%)	0.5
Forested, Mixed (%)	0.9
Shrub/Scrub (%)	0.1
Grassland/Herbaceous (%)	0.5
Pasture/Hay (%)	18.6
Cultivated Crops (%)	28.2
Developed, Total (%)	38.5
Developed, Open Space (%)	14.8
Developed, Low Intensity (%)	11.4
Developed, Medium Intensity (%)	10.2
Developed, High Intensity (%)	2.1
Population/km (2020 US Census)	874
NPDES outfalls (NPDES database)	
Total # of Permitted Outfalls	98
# of Construction Stormwater Permits	90
# of Industrial General	6
# of SID Permits	2

^a Eastern Highland Rim

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

Table 2. Physical characteristics of Beaverdam Creek at BVDL-21, May 9, 2019.

Physical Characteristics	
Width (ft)	15
Canopy Cover	Open
Depth (ft)	
Riffle	1.0
Run	1.5
Pool	3.0
% of Reach	
Riffle	2
Run	88
Pool	10
% Substrate	
Boulder	1
Clay	3
Cobble	38
Mud/Muck	1
Gravel	30
Sand	9
Silt	15
Organic Matter	3

Table 3. Results of the habitat assessment survey conducted on Beaverdam Creek at BVDL-21, May 9, 2019.

Habitat Survey	% Max Score	Rating
Instream Habitat Quality	60	Sub-optimal (55-74.999)
Sediment Deposition	36	Marginal (30-49.999)
Riffle Frequency	23	Poor (0-24.999)
Bank Vegetative Stability	51	Marginal/Sub-optimal (50-54.999)
Riparian Zone Measurements	18	Poor (0-24.999)
Habitat Assessment Score	83	
% Maximum Score	41	Marginal (40-54.999)

Table 4a. Results of the macroinvertebrate survey conducted on Beaverdam Creek at BVDL-21, May 9, 2019.

Macroinvertebrate Assessment	Scores
Taxonomic richness and diversity metrics	
Taxa Count	77
# rare and highly sensitive taxa	1
# sensitive taxa	14
# sensitive EPT taxa	6
Percent taxon metrics	
% rare and highly sensitive taxa	1
% sensitive taxa	18
% sensitive EPT taxa	8
% highly tolerant taxa	13
Percent individual metrics	
% rare and highly sensitive individuals	0
% sensitive individuals	4
% sensitive EPT individuals	1
% tolerant individuals	24
WMB-I Survey Score	4.0
WMB-I Survey Rating	Fair (3.85-4.149)

Table 4b. Results of the fish survey conducted on Beaverdam Creek at BVDL-21, April 24, 2019.

Fish Assessment	Results	Scores
Taxonomic richness and diversity metrics		
Total Native Species	16	3
Number of shiner species	1	1
Number of Sucker Species	0	1
Number of darter+madtom species	5	3
Tolerance metrics		
Number of intolerant species	0	1
Percent of tolerant species	28	3
Percent Lepomis	27	3
Trophic metrics		
Percent invertivores	22	3
Percent omnivores	50	1
Percent top carnivores	0	1
Abundance, condition, and reproductive metrics		
Percent DELT+hybrids	0	5
Number of lithophilic spawners	8	3
IBI Survey Score		28
IBI Survey Rating		Poor

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 identify any stressors to the biological communities. Measurements indicate that Beaverdam Creek was meeting it's *F&W* water use classification in 2019. Based on data collected at reference reaches within the Eastern Highland Rim ecoregion (71g), median values for total iron, dissolved iron, and some nutrients, were higher than expected. Values for pH and dissolved oxygen were >90% of all verified ecoregional reference reach data collected in the ecoregion 71g.

SUMMARY

As part of the assessment process, ADEM will review the monitoring information presented in this report, along with all other available data. Bioassessment results indicated the macroinvertebrate community in Beaverdam Creek at BVDL-21 to be in *fair* condition, and the fish community was found to be in *poor* condition. Several physical and chemical parameters were elevated as compared to data from ADEM's least-impaired reference reaches in ecoregion 71g. The habitat survey also indicated issues with sediment deposition, riffle frequency, and riparian zones within the reach. Monitoring should continue to ensure that water quality and biological conditions remain stable.

Table 5. Summary of water quality data collected March-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.

BVDL-21 AL06030002-0905-100	N	Min	Max	Med	Avg	SD	10thP	90thP
Physical								
Temperature (°C)	10	15.0	24.5	19.8	19.9	3.5	15.5	24.5
Turbidity (NTU)	10	1.7	5.6	4.0	3.7	1.3	1.9	5.3
Total Dissolved Solids (mg/L)	7	91.0	106.0	99.0	99.6	5.4	91.0	106.0
Total Suspended Solids (mg/L)	7	<1.0	9.0	5.0	4.6	2.9	0.5	9.0
Specific Conductance (µmhos/cm)	10	148.0	175.0	168.7	166.0	8.5	152.0	174.5
Hardness (mg/L)	4	72.9	81.7	79.9	78.6	4.0	72.9	81.7
Alkalinity (mg/L)	8	59.4	71.9	69.0	67.4	4.6	59.4	71.9
Measured Stream Flow (cfs)	10	10.0	48.1	19.6	22.1	12.0	10.4	39.4
Chemical								
Dissolved Oxygen (mg/L)	10	6.0 ^D	10.3	7.2	7.5	1.4	6.0	9.5
pH (SU)	10	7.0 ^D	7.5	7.2	7.2	0.2	7.0	7.4
Ammonia Nitrogen (mg/L)	8	<0.004	0.047 ^D	0.018	0.021	0.018	0.002	0.047
Nitrate+Nitrite Nitrogen (mg/L)	8	0.897	2.390	1.505 ^M	1.607	0.565	0.897	2.390
Total Kjeldahl Nitrogen (mg/L)	8	<0.075	0.520	0.203	0.240	0.223	0.038	0.520
Total Nitrogen (mg/L)	8	<0.934	2.800	1.922 ^M	1.847	0.681	0.934	2.800
Dis Reactive Phosphorus (mg/L)	8	<0.006	0.006	0.003	0.004	0.001	0.003	0.006
Total Phosphorus (mg/L)	8	0.009	0.019	0.013	0.014	0.003	0.009	0.019
CBOD-5 (mg/L)	8	<2.0	2.1	1.0	1.1	0.4	1.0	2.1
Chlorides (mg/L)	8	2.6	3.6	3.1 ^M	3.1	0.3	2.6	3.6
Sulfate (mg/L)	8	2.08	5.72	4.00	3.88	1.03	2.08	5.72
Total Metals								
Aluminum (T) (mg/L)	4	0.065	0.099	0.074	0.078	0.015	0.065	0.099
Iron (T) (mg/L)	4	0.277	0.384	0.288 ^M	0.309	0.050	0.277	0.384
Manganese (T) (mg/L)	4	<0.004	0.073	0.052	0.045	0.030	0.002	0.073
Dissolved Metals								
Aluminum (mg/L)	4	<0.023	0.055	0.012	0.022	0.022	0.012	0.055
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	0.104	0.159	0.148 ^M	0.140	0.026	0.104	0.159
Lead (µg/L)	4	<0.697	<0.697	0.348	0.348	0.000	0.348	0.348
Manganese (mg/L)	4	<0.004	0.055	0.044	0.036	0.024	0.002	0.055
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	<2.340	1.170	1.170	0.000	1.170	1.170
Biological								
Chlorophyll a (mg/m³)	8	<0.80	2.40	0.94	1.06	0.65	0.50	2.40
E. coli (MPN/DL)	8	48.1	275.5	98.6	119.4	77.6	48.1	275.5

D=an individual value >90% of all verified ecoregional reference reach data collected in the ecoregion 71g; J=estimate; M=median values greater than the 90th percentile of all verified reference reach data collected in ecoregion 71g; N=# of samples.

FOR MORE INFORMATION, CONTACT:
Brien Diggs, ADEM Aquatic Assessment Unit
1350 Coliseum Boulevard Montgomery, AL 36110
(334) 260-2750 lod@adem.alabama.gov