Alabama Department of Environmental Management

Basin Assessment

Rivers and Streams Monitoring Program

2015 Monitoring Summary

Good-Fair™

Beaver Creek at US Highway 43 crossing (Marion County) (33.99592/-87.92957)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Beaver Creek watershed for biological and water quality monitoring as part of the 2015 Rivers and Streams Monitoring Project. The objectives of the project were to provide data to fully assess each site and to estimate overall water quality statewide using macroinvertebrate and habitat surveys and intensive water quality sampling.

Figure 1. Beaver Creek at BVRM-79, August 4, 2015.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Beaver Creek is a *Fish and Wildlife (F&W)* stream in the Fall Line Hills ecoregion (65i) of Marion County. The watershed drains approximately 22 square miles of land near Guin, Alabama. Based on the 2011 National Land Cover Dataset, landuse within the watershed is primarily forest (62%) and shrub/scrub. As of April 1, 2016, two outfalls were active within the watershed.

REACH CHARACTERISTICS

General observations (Table 2) and a habitat assessment (Table 3) were completed during the macroinvertebrate community bioassessment. 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. Beaver Creek at BVRM-79 is a riffle-run stream with a substrate consisting of sand, gravel, and hardpan clay (Figure 1). Overall habitat quality and availability was rated as *marginal* for supporting diverse macroinvertebrate communities.

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 community 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 macroinvertebrate survey conducted at BVRM-79 rated the site as a *3-*, or *Good-Fair* (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Tombigbee R
Drainage Area (mi^2)		22
Ecoregion[a]		65I
% Landuse[b]		
Open water		<1%
Wetland	Woody	2%
	Emergent herbaceous	<1%
Forest	Deciduous	34%
	Evergreen	19%
	Mixed	9%
Shrub/scrub		18%
Grassland/herbaceous		5%
Pasture/hay		6%
Cultivated crops		1%
Development	Open space	4%
	Low intensity	1%
	Moderate intensity	<1%
	High intensity	<1%
Barren		<1%
Population/km^2[c]		6
# NPDES Permits[d]	**TOTAL**	20
Construction		17
Industrial General		2

a. Fall Line Hills

b. 2011 National Land Cover Dataset

c. 2010 US Census

d. #NPDES outfalls downloaded from ADEM's NPDES Management System database, April 1, 2016.

Table 2. Physical characteristics of Beaver Creek at BVRM-79, June 9, 2015.

Physical Characteristics		
Width (ft)		15
Canopy Cover		Mostly Open
Depth (ft)		
	Riffle	0.5
	Run	1.5
	Pool	2.5
% of Reach		
	Riffle	5
	Run	50
	Pool	45
% Substrate		
	Cobble	5
	Gravel	20
	Hard Pan Clay	15
	Sand	45
	Silt	5
	Organic Matter	10

Table 3. Results of the habitat assessment conducted on Beaver Creek at BVRM-79, June 9, 2015.

Habitat Assessment	% Maximum Score	Rating
Instream Habitat Quality	53	Marginal (31-54)
Sediment Deposition	34	Marginal (31-54)
Riffle Frequency	50	Marginal (31-54)
Bank Vegetative Stability	35	Marginal (31-57)
Riparian Buffer	65	Sub-optimal (60-84)
Habitat Assessment Score	***96***	
% Maximum Score	***48***	**Marginal (31-56)**

Table 4. Results of the macroinvertebrate community bioassessment conducted in Beaver Creek at BVRM-79, June 9, 2015.

Macroinvertebrate Assessment	
	Results
Taxa richness and diversity measures	
Total # Taxa	50
# EPT taxa	14
# Highly-sensitive and Specialized Taxa	2
Taxonomic composition measures	
% EPC taxa	34
% EPT minus Baetidae and Hydropsychidae	12
% Chironomidae Individuals	59
% Dominant Taxon	19
% Individuals in Dominant 5 Taxa	48
Functional feeding group	
# Collector Taxa	15
% Tolerant Filterer Taxa	10
Community tolerance	
# Sensitive EPT	7
% Sensitive taxa	30
% Nutrient Tolerant individuals	32
WMB-I Assessment Score	**3-**
WMB-I Assessment Rating	**Good-Fair**

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. In situ measurements and water samples were collected March through October of 2015 to help identify any stressors to the biological communities. Metals (April, July, August, and October) and organics (April) were also collected. The July *E. coli* sample exceeded the human health criterion applicable to *F&W* streams. The flow during that visit was 48.6 cfs. Median specific conductance and hardness were higher than the median of verified ecoregional reference reach data collected in ecoregion 68i. The median total aluminum concentration was higher than 90% of verified ecoregional reference reach data collected within the same ecoregion.

SUMMARY

Results of the macroinvertebrate survey conducted in Beaver Creek at BVRM-79 indicated the community to be *good-fair* condition, despite *marginal* habitat quality and availability within the reach. Specific conductance, hardness and dissolved total aluminum concentrations were slightly higher than expected in streams located in the Fall Line ecoregion. Monitoring of this site should continue in order to ensure its biological integrity.

Table 5. Summary of water quality data collected March-October, 2015. Minimum (Min) and maximum (Max) values calculated using minimum detection limits (MDL). Median, average (Avg), and standard deviations (SD) values were calculated by multiplying the MDL by 0.5 when results were less than this value.

	Parameter	N	Min	Max	Med	Avg	SD	E
	Physical							
	Temperature (°C)	10	12.7	24.3	19.2	18.5	3.9	
	Turbidity (NTU)	9	4.8	14.2	8.6	9.5	3.6	
	Total Dissolved Solids (mg/L)	8	23.0	53.0	28.5	32.6	10.2	
J	Total Suspended Solids (mg/L)	8	1.0	38.0	6.5	12.4	12.8	
	Specific Conductance (µmhos/cm)	10	23.9	34.7	30.8 G	30.7	3.3	
	Hardness (mg/L)	4	7.3	13.0	9.8 G	10.0	2.8	
	Alkalinity (mg/L)	8	5.8	8.5	6.4	6.8	1.0	
	Monthly Stream Flow (cfs)	8	5.7	53.9	32.6	31.2	19.5	
	Chemical							
	Dissolved Oxygen (mg/L)	10	7.2	10.5	9.0	9.1	1.0	
	pH (SU)	10	6.1	7.1	6.5	6.6	0.4	
J	Ammonia Nitrogen (mg/L)	8	< 0.007	0.109	0.024	0.038	0.041	
	Nitrate+Nitrite Nitrogen (mg/L)	8	0.069	0.181	0.160	0.149	0.035	
J	Total Kjeldahl Nitrogen (mg/L)	8	0.072	0.514	0.254	0.291	0.174	
J	Total Nitrogen (mg/L)	8	0.245	0.683	0.402	0.440	0.178	
J	Dis Reactive Phosphorus (mg/L)	8	< 0.003	0.005	0.003	0.003	0.001	
J	Total Phosphorus (mg/L)	8	0.008	0.038	0.014	0.017	0.009	
J	CBOD-5 (mg/L)	8	< 2.0	< 2.0	1.0	1.0	0.0	
	Chlorides (mg/L)	8	1.4	1.8	1.5	1.6	0.2	
	Atrazine (µg/L)	1	<			0.10		
	Total Metals							
J	Aluminum (mg/L)	4	< 0.106	2.170	0.844	0.978	1.032	
	Iron (mg/L)	4	0.499	1.640	1.052	1.060	0.583	
J	Manganese (mg/L)	4	0.080	0.106	0.090	0.092	0.012	
	Dissolved Metals							
J	Aluminum (mg/L)	4	< 0.106	0.144	0.053	0.076	0.046	
	Antimony (µg/L)	4	< 0.342	< 0.342	0.171	0.171	0.000	
	Arsenic (µg/L)	4	< 0.276	< 0.276	0.138	0.138	0.000	
	Cadmium (µg/L)	4	< 0.311	< 0.311	0.156	0.156	0.000	
J	Chromium (µg/L)	4	< 0.347	0.781	0.428	0.453	0.325	
J	Copper (µg/L)	4	< 0.218	0.588	0.361	0.355	0.196	
J	Iron (mg/L)	4	0.139	0.314	0.166	0.196	0.080	
	Lead (µg/L)	4	< 0.428	< 0.428	0.214	0.214	0.000	
J	Manganese (mg/L)	4	0.057	0.081	0.074	0.072	0.010	
J	Nickel (µg/L)	4	< 0.460	1.190	0.766	0.738	0.417	
	Selenium (µg/L)	4	< 0.395	< 0.395	0.198	0.198	0.000	
	Silver (µg/L)	4	< 0.365	< 0.365	0.182	0.182	0.000	
	Thallium (µg/L)	4	< 0.514	< 0.514	0.257	0.257	0.000	
J	Zinc (µg/L)	4	1.121	10.332	2.168	3.947	4.323	
	Biological							
J	Chlorophyll a (mg/m³)	8	< 0.10	1.90	0.50	0.71	0.72	
J	E. coli (MPN/DL)	8	68.3	980.4 H	225.8	293.2	293.0	1

E=# of samples that exceeded criteria; G=value higher than median concentration of all verified ecoregional reference reach data collected in the ecoregion 68I; H=*F&*W human health criterion exceeded; J=estimate; N=# samples

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