Beaver Creek at Houston County Road 59 (31.21647/-85.48691)

BACKGROUND

A two and a half mile segment of Beaver Creek from Newton Creek upstream to the Dothan wastewater treatment plant has been on Alabama's Clean Water Act (CWA) §303(d) list of impaired waters since 1998. It was listed for nutrient and organic enrichment (OE) and low dissolved oxygen (DO) due to municipal sources and storm sewer and urban runoff. The Alabama Department of Environmental Manamgement (ADEM) monitored Beaver Creek in 2014 to determine the condition of the water quality and biological communities in the reach. These data will be used to develop Total Maximum Daily Loads (TMDLs) for each of these pollutants by 2016.

The ADEM also selected the Beaver Creek watershed for biological and water quality monitoring as part of the 2014 Assessment of the Southeast Alabama (SEAL) River Basin. The objectives of this project were to assess the biological integrity of each monitoring site and to estimate overall water quality within the SEAL basin.

Figure 1. Beaver Creek at BVC-2, May 7, 2014.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Beaver Creek at BVC-2 is a *Fish & Wildlife (F&W)* stream located in Houston County in the city of Dothan. Based on the 2011 National Land Cover Dataset, land use within the watershed is primarily development (53%) and forest (18%). Population density is relatively high. As of April 1, 2016, there were 59 outfalls active in this watershed.

REACH CHARACTERISTICS

General observations (Table 2) and a habitat assessment (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. Beaver Creek at BVC-2 is a glide-pool stream located in the Dougherty Plain ecoregion (Figure 1). Bottom substrate consists primarily of sand and organic matter. Overall habitat quality was rated as *marginal* for supporting a diverse aquatic macroinvertebrate community.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Choctawhatchee R
Drainage Area (mi²)		19
Ecoregion[a]		65G
% Landuse[b]		
Open water		<1
Wetland	Woody	3%
	Emergent herbaceous	<1%
Forest	Deciduous	3%
	Evergreen	14%
	Mixed	1%
Shrub/scrub		9%
Grassland/herbaceous		1%
Pasture/hay		5%
Cultivated crops		10%
Development	Open space	22%
	Low intensity	19%
	Moderate intensity	8%
	High intensity	4%
Population/km²[c]		400
# NPDES Permits[d]	**TOTAL**	59
Construction		47
Industrial General		7
No Exposure		2
Small Mining		2
Underground Injection Control		1

a. Dougherty Plain

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 BVC-2, June 30, 2014.

Physical Characteristics		
Width (ft)		30
Canopy cover		Mostly Shaded
Depth (ft)		
	Run	1.5
	Pool	1.5
% of Reach		
	Run	40
	Pool	60
% Substrate		
	Mud/Muck	5
	Sand	50
	Silt	10
	Organic Matter	35

Table 3. Results of the habitat assessment conducted in Beaver Creek at BVC-2, June 30, 2014.

Habitat Assessment	% Maximum Score	Rating
Instream Habitat Quality	48	Marginal (31-<55)
Sediment Deposition	55	Sub-Optimal (55-79)
Sinuosity	35	Marginal (31-<55)
Bank and Vegetative Stability	25	Poor (<31)
Riparian Buffer	70	Sub-Optimal (60-84)
Habitat Assessment Score	**85**	
% Maximum Score	**47**	**Marginal (31-57)**

BIOASSESSMENT RESULTS

The benthic macroinvertebrate community was sampled using ADEM's Intensive Multi-habitat Bioassessment methodology (WMB-I). The WMB-I measures taxonomic richness, community composition, and community tolerance to assess the overall health of the macroinvertebrate community. Each score is based on a 100 point scale. The final score is the average of the individual metric scores. The metric results indicated the macroinvertebrate community to be in *poor* condition due to a high percentage of nutrient tolerant organisms and a lack of sensitive individuals in the reach (Table 4).

Table 4. Results of the macroinvertebrate bioassessment conducted in Beaver Creek at BVC-2, June 30, 2014.

Macroinvertebrate Assessment	
	Results
Taxa richness and diversity measures	
# EPT taxa	6
Taxonomic composition measures	
% Non-insect taxa	21
% Plecoptera	0
% Dominant taxon	27
Functional feeding group	
% Predators	10
Community tolerance	
Becks community tolerance index	2
% Nutrient tolerant individuals	53
WMB-I Assessment Score	**25**
WMB-I Assessment Rating	**Poor (19-37)**

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. In situ measurements and water samples were collected monthly during March through October 2014 to help identify any stressors to the biological community. All parameters met *F&W* use classification criteria throughout the sampling season. However, specific conductance, alkalinity, and nitrate-nitrite nitrogen concentrations were higher than expected for streams in the Dougherty Plain ecoregion (65g).

Table 5. Summary of water quality data collected March-October, 2014. 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

Parameter	N	Min		Max		Med	Avg	SD
Physical								
Temperature (°C)	10		15.6		24.8	23.4	21.6	3.3
Turbidity (NTU)	14		5.8		19.3	9.3	10.5	3.9
Total Dissolved Solids (mg/L)	8		26.0		86.0	51.5	53.9	19.8
J Total Suspended Solids (mg/L)	8		1.0		15.0	5.5	6.2	4.6
Specific Conductance (μmhos)	10		68.5		78.1	76.6 G	75.3	3.1
Alkalinity (mg/L)	8		21.2		27.2	26.8 M	25.4	2.3
Stream Flow (cfs)	8		13.8		34.1	18.3	19.8	6.6
Stream Flow during Sample Collection (cfs)	8		13.8		34.1	18.3	19.8	6.6
Chemical								
Dissolved Oxygen (mg/L)	10		5.5		8.4	6.5	6.7	1.0
pH (su)	10		6.4		6.7	6.6	6.6	0.1
J Ammonia Nitrogen (mg/L)	8	<	0.006		0.035	0.012	0.015	0.013
Nitrate+Nitrite Nitrogen (mg/L)	8		0.331		0.546	0.373 M	0.388	0.068
J Total Kjeldahl Nitrogen (mg/L)	8		0.142		0.425	0.311	0.296	0.088
J Total Nitrogen (mg/L)	8		0.544		0.903	0.691	0.684	0.115
J Dissolved Reactive Phosphorus (mg/L)	8		0.004		0.006	0.006	0.005	0.001
Total Phosphorus (mg/L)	8		0.022		0.032	0.026	0.027	0.004
J CBOD-5 (mg/L)	8	<	2.0	<	2.0	1.0	1.0	0.0
Chlorides (mg/L)	8		4.7		6.9	5.9	5.8	0.6
Biological								
Chlorophyll a (ug/L)	8	<	0.10		3.05	1.05	1.08	1.06

G=value higher than median concentration of all verified ecoregional reference reach data collected in the ecoregion 65g; J=estimate; M=value >90% of all verified ecoregional reference reach data collected in the ecoregion 65g; N= # of samples.

SUMMARY

The habitat assessment conducted in Beaver Creek at BVC-2 indicated the reach to be *marginal* for supporting a diverse biological community. Bioassessment results indicated the macroinvertebrate community in the reach to be in *poor* condition. Results of water chemistry analyses showed that all parameters met *F&W* use classification criteria throughout the sampling season. However, conductivity, alkalinity, and nitrate-nitrite nitrogen concentrations were higher than expected for the Dougherty Plain ecoregion. This data and other available data will be reviewed to identify stressors of the degraded biological condition in the reach.