

# 2014 Monitoring Summary



## Mayo Mill Creek at Nalty Road in Escambia County (31.06273/-86.96919)

### BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Mayo Mill Creek for biological and water quality monitoring as part of the 2014 Assessment of South East Alabama (SEAL) River Basins. The objectives of the SEAL Basin Assessments were to assess the biological integrity of each monitoring site and to estimate overall water quality within the SEAL basin group.



Figure 1. Mayo Mill Creek at MMCE-1, June 18, 2014.

### WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Mayo Mill Creek is a small *Fish & Wildlife (F&W)* stream located in the Southern Pine Plains and Hills ecoregion (65f). It flows into the Conecuh River approximately 1.5 stream miles downstream of the assessment location. Based on the 2011 National Land Cover Dataset, landuse within the watershed is primarily forest (65%), followed by grassland and shrubs/scrubs. Silviculture is also prevalent in the area. Population density is very low. As of April 1, 2016, no outfalls are 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. Mayo Mill Creek at MMCE-1 is a low-gradient stream composed of sand and gravel substrates (Figure 1). Overall habitat quality was rated as *marginal* for supporting biological communities.

### BIOASSESSMENT RESULTS

Benthic macroinvertebrate communities were sampled using ADEM's Intensive Multi-habitat Bioassessment methodology (WMB-I). The WMB-I uses measures of taxonomic richness, community composition, and community tolerance to assess the overall health of the macroinvertebrate community. Each metric is scored on a 100 point scale. The final score is the average of all individual metric scores. The final score indicated the biological community to be in *poor* condition (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		Conecuh River
<b>Basin</b>		8
<b>Drainage Area (mi<sup>2</sup>)</b>		65F
<b>Ecoregion<sup>a</sup></b>		
<b>% Landuse</b>		
Open water		<1%
Wetland	Woody	1%
	Emergent herbaceous	<1%
Forest	Deciduous	2%
	Evergreen	58%
	Mixed	5%
Shrub/scrub		13%
Grassland/herbaceous		17%
Pasture/hay		1%
Cultivated crops		1%
Development	Open space	1%
	Low intensity	<1%
	Moderate intensity	<1%
<b>Population/km<sup>2b</sup></b>		2

a. Southern Pine Plains & Hills

b. 2010 US Census

Table 2. Physical characteristics of Mayo Mill Creek at MMCE-1, June 18, 2014.

Physical Characteristics	
<b>Width (ft)</b>	45
<b>Canopy Cover</b>	Open
<b>Depth (ft)</b>	
	Run 1.0
<b>% of Reach</b>	
	Run 100
<b>% Substrate</b>	
	Gravel 20
	Sand 73
	Silt 1
	Organic Matter 6

**Table 3.** Results of the habitat assessment conducted on Mayo Mill Creek at MMCE-1, June 18, 2014.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	26	Poor (<31)
Sediment Deposition	38	Marginal (31-<55)
Sinuosity	33	Marginal (31-<55)
Bank and Vegetative Stability	69	Sub-Optimal (58-79)
Riparian Buffer	85	Optimal (>84)
<b>Habitat Assessment Score</b>	<b>91</b>	
<b>% Maximum Score</b>	<b>51</b>	<b>Marginal (31-&lt;57)</b>

**Table 4.** Results of the macroinvertebrate assessment conducted in Mayo Mill Creek at MMCE-1, June 18, 2014.

Macroinvertebrate Assessment		
	Results	Scores
<b>Taxa richness and diversity measures</b>		<b>(0-100)</b>
% EPC taxa	23	31
% Trichoptera & Chironomidae Taxa	62	0
<b>Taxonomic composition measures</b>		
% EP Individuals	18	34
<b>Functional feeding group</b>		
% Collector-Filterer Individuals	21	69
<b>Community tolerance</b>		
% Nutrient Tolerant individuals	59	10
<b>WMB-I Assessment Score</b>	---	<b>29</b>
<b>WMB-I Assessment Rating</b>		<b>Poor (15-30)</b>

## WATER CHEMISTRY

Results of water chemistry are presented in Table 5. In situ measurements and water samples were collected monthly, and semi-monthly (metals) from March through September of 2014 to help identify any stressors to the biological communities. Dissolved oxygen was below the criterion for the month of August. Stream pH was lower than the established criteria for F&W water use classification during all sampling events. Although streams in this ecoregion are naturally acidic, median pH was lower than expected based on ecoreference data. Median specific conductance was higher than expected in comparison with median reference reach data collected in ecoregion/subcoregion 65f.

Metals (total and dissolved manganese, aluminum, dissolved zinc) were higher than background levels based on reference reach data collected in ecoregion/subcoregion 65f. Zinc exceeded hardness-adjusted criteria for all four sampling events while Nickel exceeded in two, and Copper in one respectively. Antimony exceeded human health criterion for fish and water consumption in September.

## SUMMARY

Bioassessment results indicated the macroinvertebrate community in Mayo Mill Creek at MMCE-1 to be in *poor* condition. Metals and conductivity were higher than background levels based on reference reach data collected in ecoregion 65f. Stream pH values were lower than expected in comparison with other streams in the same ecoregion. Instream habitat was also limited. Monitoring and bioassessment should be continued to ensure the water quality and biological communities are stable.

**Table 5.** Summary of water quality data collected March-September, 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 value.

Parameter	N	Min	Max	Med	Avg	SD	E	Q
<b>Physical</b>								
Temperature (°C)	9	14.4	25.2	22.6	21.3	3.8		
Turbidity (NTU)	9	3.2	15.5	8.4	7.8	4.2		
Total Dissolved Solids (mg/L)	8	34.0	52.0	42.0	43.4	7.4		
Total Suspended Solids (mg/L)	8	1.0	26.0	10.5	11.9	9.1		
Specific Conductance (µmhos)	9	48.2	71.7	56.2 <sup>G</sup>	57.8	8.7		
Hardness (mg/L)	4	3.5	5.8	4.4	4.5	1.0		
Alkalinity (mg/L)	8	< 0.9	< 1.2	0.5	0.5	0.0		
Monthly Stream Flow (cfs)	9	5.9	28.2	18.5	16.4	7.5		
Stream Flow during Sample Collection (cfs)	9	5.9	28.2	18.5	16.4	7.5		
<b>Chemical</b>								
Dissolved Oxygen (mg/L)	9	2.6 <sup>C</sup>	10.2	8.4	7.7	2.3	1	
pH (su)	9	3.7 <sup>C</sup>	4.2 <sup>C</sup>	3.9	3.9	0.2	9	
Ammonia Nitrogen (mg/L)	8	< 0.006	< 0.010	0.003	0.004	0.001		
Nitrate+Nitrite Nitrogen (mg/L)	8	0.034	0.066	0.048	0.049	0.012		
Total Kjeldahl Nitrogen (mg/L)	8	0.070	0.328	0.190	0.202	0.094		
Total Nitrogen (mg/L)	8	0.113	0.377	0.248	0.251	0.089		
Dissolved Reactive Phosphorus (mg/L)	8	< 0.003	0.005	0.002	0.002	0.001		
Total Phosphorus (mg/L)	8	0.008	0.016	0.010	0.011	0.002		
CBOD-5 (mg/L)	8	< 2.0	< 2.0	1.0	1.0	0.0		
COD (mg/L)	7	< 1.6	19.0	6.1	6.2	6.6		
TOC (mg/L)	8	1.5	4.6	2.0	2.5	1.2		
Chlorides (mg/L)	8	2.0	2.5	2.4	2.4	0.2		
<b>Total Metals</b>								
Aluminum (mg/L)	4	0.468	0.778	0.629 <sup>M</sup>	0.626	0.128		
Iron (mg/L)	4	0.742	1.140	1.125	1.033	0.194		
Manganese (mg/L)	4	0.042	0.058	0.045 <sup>M</sup>	0.048	0.007		
<b>Dissolved Metals</b>								
Aluminum (mg/L)	4	< 0.050	0.421	0.406 <sup>M</sup>	0.315	0.193		
Antimony (µg/L)	4	< 0.2	9.3 <sup>H</sup>	0.2	2.5	4.6	1	
Arsenic (µg/L)	4	< 0.2	3.5 <sup>H</sup>	0.3	0.6	0.8	1	
Cadmium (µg/L)	4	< 0.246	3.900 <sup>S</sup>	0.458	0.748	0.862	1	
Chromium (µg/L)	4	< 0.410	4.300	0.780	1.030	0.777		
Copper (mg/L)	4	0.000	0.013 <sup>S</sup>	0.003	0.005	0.006	1	2
Iron (mg/L)	4	< 0.037	0.629	0.492	0.408	0.280		
Lead (µg/L)	4	< 0.2	5.3 <sup>S</sup>	0.4	0.9	1.2	2	
Manganese (mg/L)	4	0.040	0.056	0.044 <sup>M</sup>	0.046	0.007		
Nickel (mg/L)	4	0.005	0.006 <sup>S</sup>	0.006	0.005	0.001	2	1
Selenium (µg/L)	4	< 0.4	< 4.9	0.2	0.8	1.1		
Silver (µg/L)	4	< 0.252	4.600	0.302	0.758	1.042		
Thallium (µg/L)	4	< 0.2	6.4 <sup>H</sup>	0.2	0.9	1.5	1	
Zinc (mg/L)	4	0.022	0.123 <sup>S</sup>	0.046 <sup>M</sup>	0.060	0.045	4	
<b>Biological</b>								
Chlorophyll a (ug/L)	8	< 0.10	8.54	0.36	1.48	2.90		
E. coli (col/100mL)	8	9	91	44	52	30		

C=value > criteria established for Fish & Wildlife streams; E= # samples exceeded criteria; G=value higher than median concentration of all verified ecoregional reference reach data collected in the ecoregion (65f); H=F&W human health criterion exceeded; J=estimate; M=value > 90% of all verified ecoregional reference data within ecoregion 65f; N=# samples; Q= criterion exceedance uncertain; S=hardness-adjusted criteria

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