

# 2011 Monitoring Summary



## Hammar Creek in Mobile County at Padgett Switch Road (30.42820/-88.23050)

### BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Escatawpa River watershed for biological and water quality monitoring as part of the 2011 EMT Basin Assessment. The objectives of the project were to assess the biological integrity of each monitoring site and to estimate overall water quality within the Escatawpa River Basin.



Figure 1. Hammar Creek at HMC-1, June 14, 2011.

### WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Hammar Creek is a Fish & Wildlife (F&W) stream located in the Gulf Coast Flatwoods ecoregion (75a). Based on the 2011 National Land Cover Dataset, landuse within the watershed is predominantly pasture/hay. Population is low with little development in the area. As of April 1, 2016, ADEM's NPDES Management System database showed 15 discharges located within the 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. Hammar Creek at HMC-1 is a low-gradient, glide-pool stream with substrate composed primarily of sand, organic matter, and hard pan clay (Figure 1). Overall habitat quality and availability was rated as *optimal* for supporting diverse aquatic macroinvertebrate 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 overall WMB-I scored HMC-1 with a *fair* community condition (Table 4).

Table 1. Summary of watershed characteristics.

| Watershed Characteristics             |                               | Escatawpa R |
|---------------------------------------|-------------------------------|-------------|
| <b>Basin</b>                          |                               | Escatawpa R |
| <b>Drainage Area (mi<sup>2</sup>)</b> |                               | 18          |
| <b>Ecoregion<sup>a</sup></b>          |                               | 75A         |
| <b>% Landuse<sup>b</sup></b>          |                               |             |
| Open water                            |                               | <1%         |
| Wetland                               | Woody                         | 15%         |
|                                       | Emergent herbaceous           | <1%         |
| Forest                                | Deciduous                     | 1%          |
|                                       | Evergreen                     | 9%          |
|                                       | Mixed                         | 1%          |
| Shrub/scrub                           |                               | 11%         |
| Grassland/herbaceous                  |                               | 7%          |
| Pasture/hay                           |                               | 37%         |
| Cultivated crops                      |                               | 6%          |
| Development                           | Open space                    | 9%          |
|                                       | Low intensity                 | 3%          |
|                                       | Moderate intensity            | <1%         |
|                                       | High intensity                | <1%         |
| Barren                                |                               | <1%         |
| <b>Population/km<sup>2c</sup></b>     |                               | 126         |
| <b># NPDES Permits<sup>d</sup></b>    | <b>TOTAL</b>                  | 15          |
|                                       | Construction                  | 8           |
|                                       | Industrial General            | 3           |
|                                       | Mining                        | 1           |
|                                       | Small Mining                  | 1           |
|                                       | Underground Injection Control | 2           |

a. Gulf Coast Flatwoods

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 Hammar Ck at HMC-1, August 30, 2011.

| Physical Characteristics |                       |
|--------------------------|-----------------------|
| <b>Canopy Cover</b>      | <b>Mostly Shaded</b>  |
| <b>Width (ft)</b>        | <b>16.0</b>           |
| <b>Depth (ft)</b>        |                       |
|                          | <b>Run</b>            |
|                          | <b>Pool</b>           |
|                          | <b>4.0</b>            |
|                          | <b>7.0</b>            |
| <b>% of Reach</b>        |                       |
|                          | <b>Run</b>            |
|                          | <b>Pool</b>           |
|                          | <b>45</b>             |
|                          | <b>55</b>             |
| <b>% Substrate</b>       |                       |
|                          | <b>Boulder</b>        |
|                          | <b>Clay</b>           |
|                          | <b>Mud/Muck</b>       |
|                          | <b>Hard Pan Clay</b>  |
|                          | <b>Sand</b>           |
|                          | <b>Silt</b>           |
|                          | <b>Organic Matter</b> |
|                          | <b>1</b>              |
|                          | <b>5</b>              |
|                          | <b>10</b>             |
|                          | <b>35</b>             |
|                          | <b>30</b>             |
|                          | <b>3</b>              |
|                          | <b>16</b>             |

Table 3. Results of the habitat assessment conducted on Hammar Ck at HMC-1, Aug 30, 2011.

| Habitat Assessment              | % Maximum Score | Rating                  |
|---------------------------------|-----------------|-------------------------|
| Instream Habitat Quality        | 62              | Sub-Optimal (53-65)     |
| Sediment Deposition             | 74              | Optimal (>65)           |
| Sinuosity                       | 75              | Sub-Optimal (65-<85)    |
| Bank Vegetative Stability       | 75              | Optimal (>=75)          |
| Riparian Buffer                 | 88              | Sub-Optimal (70-90)     |
| <b>Habitat Assessment Score</b> | <b>147</b>      |                         |
| <b>% of Maximum Score</b>       | <b>74</b>       | <b>Optimal (&gt;65)</b> |

Table 4. Results of the macroinvertebrate bioassessment conducted in Hammar Creek at HMC-1, August 30, 2011.

| Macroinvertebrate Assessment                |                                 | Results             |
|---|---------------------------------|---------------------|
| <b>Taxa richness and diversity measures</b> |                                 |                     |
|   | # EPT taxa                      | 14                  |
| <b>Taxonomic composition measures</b>       |                                 |                     |
|   | % Non-insect taxa               | 9                   |
|   | % Plecoptera                    | 0                   |
|   | % Dominant taxon                | 27                  |
| <b>Functional feeding group</b>             |                                 |                     |
|   | % Predators                     | 15                  |
| <b>Community tolerance</b>                  |                                 |                     |
|   | Becks community tolerance index | 15                  |
|   | % Nutrient tolerant individuals | 41                  |
|   | <b>WMB-I Assessment Score</b>   | <b>52</b>           |
|   | <b>WMB-I Assessment Rating</b>  | <b>Fair (37-55)</b> |

## WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. In situ measurements and water samples were collected monthly, semi-monthly (metals), or quarterly (pesticides, atrazine, and semi-volatile organics) during March through October of 2011 to help identify any stressors to the biological communities.

## SUMMARY

Bioassessment results indicated the macroinvertebrate community to be in *fair* condition. Habitat assessment results and intensive water quality sampling suggested habitat degradation and nutrient enrichment as potential impacts to biological condition. Diversity of the macroinvertebrate community may also be slightly lower in late August as a result of insect emergence. Monitoring should continue to ensure that conditions at the site remain stable.

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Table 5. Summary of water quality data collected March-October, 2011. 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 |
|--|-----|----------|---------|-------|-------|-------|---|
| <b>Physical</b>                        |     |          |         |       |       |       |   |
| Temperature (°C)                       | 9   | 16.3     | 24.5    | 22.6  | 21.7  | 3.0   |   |
| Turbidity (NTU)                        | 8   | 2.0      | 5.5     | 2.8   | 3.3   | 1.4   |   |
| Total Dissolved Solids (mg/L)          | 7   | 38.0     | 72.0    | 43.0  | 47.7  | 11.3  |   |
| Total Suspended Solids (mg/L)          | 7 < | 5.0      | 5.0     | 2.5   | 2.8   | 0.9   |   |
| Specific Conductance (µmhos)           | 9   | 47.8     | 71.0    | 54.0  | 54.4  | 7.1   |   |
| J Hardness (mg/L)                      | 6   | 10.4     | 17.0    | 11.2  | 12.5  | 2.8   |   |
| J Alkalinity (mg/L)                    | 7 < | 4.0      | 7.0     | 6.0   | 5.4   | 1.7   |   |
| Stream Flow (cfs)                      | 9   | 7.9      | 23.0    | 12.8  | 14.6  | 4.7   |   |
| <b>Chemical</b>                        |     |          |         |       |       |       |   |
| Dissolved Oxygen (mg/L)                | 9   | 5.2      | 8.2     | 6.8   | 6.7   | 0.8   |   |
| pH (su)                                | 9   | 5.0      | 6.9     | 5.9   | 5.9   | 0.6   |   |
| J Ammonia Nitrogen (mg/L)              | 7 < | 0.014    | <0.014  | 0.007 | 0.007 | 0.000 |   |
| J Nitrate-Nitrite Nitrogen (mg/L)      | 7   | 0.132    | 0.380   | 0.300 | 0.280 | 0.083 |   |
| J Total Kjeldahl Nitrogen (mg/L)       | 7   | 0.190    | 1.100   | 0.340 | 0.491 | 0.302 |   |
| J Total Nitrogen (mg/L)                | 7   | 0.557    | 1.418   | 0.672 | 0.771 | 0.304 |   |
| J Dissolved Reactive Phosphorus (mg/L) | 7   | 0.007    | 0.200   | 0.007 | 0.036 | 0.072 |   |
| J Total Phosphorus (mg/L)              | 7 < | 0.004    | 0.017   | 0.013 | 0.012 | 0.005 |   |
| J CBOD-5 (mg/L)                        | 7 < | 1.0      | <1      | 0.5   | 0.5   | 0.0   |   |
| J Chlorides (mg/L)                     | 7   | 7.3      | 9.8     | 8.5   | 8.5   | 0.8   |   |
| J Atrazine (µg/L)                      | 3 < | 0.02     | 0.08    | 0.01  | 0.03  | 0.04  |   |
| <b>Total Metals</b>                    |     |          |         |       |       |       |   |
| J Aluminum (mg/L)                      | 6   | 0.153    | 0.412   | 0.196 | 0.244 | 0.108 |   |
| J Iron (mg/L)                          | 6   | 0.460    | 0.973   | 0.782 | 0.747 | 0.194 |   |
| J Manganese (mg/L)                     | 6   | 0.026    | 0.084   | 0.036 | 0.045 | 0.026 |   |
| <b>Dissolved Metals</b>                |     |          |         |       |       |       |   |
| J Aluminum (mg/L)                      | 6 < | 0.044    | 0.292   | 0.142 | 0.147 | 0.101 |   |
| J Antimony (µg/L)                      | 6 < | 1.9      | <2.3    | 1.2   | 1.1   | 0.1   |   |
| Ar Arsenic (µg/L)                      | 6 < | 1.4      | <2.8    | 1.2   | 1.1   | 0.3   |   |
| J Cadmium (mg/L)                       | 6 < | 0.000022 | <0.0013 | 0.000 | 0.000 | 0.000 |   |
| J Chromium (mg/L)                      | 6 < | 0.006    | <0.006  | 0.003 | 0.003 | 0.000 |   |
| Copper (mg/L)                          | 6 < | 0.005    | <0.005  | 0.002 | 0.002 | 0.000 |   |
| J Iron (mg/L)                          | 6   | 0.284    | 0.401   | 0.308 | 0.328 | 0.052 |   |
| J Lead (µg/L)                          | 6 < | 0.8      | <0.9    | 0.4   | 0.4   | 0.0   |   |
| J Manganese (mg/L)                     | 6   | 0.018    | 0.077   | 0.030 | 0.038 | 0.022 |   |
| J Mercury (µg/L)                       | 5 < | 0.072    | 0.165   | 0.052 | 0.072 | 0.053 |   |
| J Nickel (mg/L)                        | 6 < | 0.007    | <0.007  | 0.004 | 0.004 | 0.000 |   |
| Selenium (µg/L)                        | 6 < | 0.8      | <1.3    | 0.4   | 0.5   | 0.1   |   |
| Silver (mg/L)                          | 6 < | 0.000015 | <0.0002 | 0.000 | 0.000 | 0.000 |   |
| J Thallium (µg/L)                      | 8 < | 0.9      | <1.2    | 0.5   | 0.5   | 0.1   |   |
| J Zinc (mg/L)                          | 6 < | 0.032    | <0.032  | 0.016 | 0.016 | 0.000 |   |
| <b>Biological</b>                      |     |          |         |       |       |       |   |
| Chlorophyll a (ug/L)                   | 6 < | 1.00     | 1.40    | 0.50  | 0.65  | 0.37  |   |
| J E. coli (col/100mL)                  | 7   | 10       | 530     | 140   | 173   | 176   |   |

E=# samples that exceeded criteria; J=estimate; M=value >90% of all verified ecoregional reference reach data collected in the ecoregion 68; N=# samples.