

# 2009 Monitoring Summary



## Bumpass Creek at Lauderdale County Road 14 (34.94544/-88.06445)

### BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Bumpass Creek watershed for biological and water quality monitoring as part of the 2009 Assessment of the Tennessee (TN) River Basin. The objectives of the Tennessee River Basin Assessments were to assess the biological integrity of each monitoring site and to estimate overall water quality within the Tennessee River basin group. A habitat and macroinvertebrate assessment was conducted on Bumpass Creek at BMPL-2 on June 24, 2009.

Bumpass Creek is also an ecoreference candidate station. The 2009 data will be used to evaluate Bumpass Creek as a "best attainable" condition reference watershed for comparison with other streams in the Transition Hills sub-ecoregion.



Figure 1. Bumpass Creek at BMPL-2, April 14, 2009.

### WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Bumpass Creek at BMPL-2 is a *Fish & Wildlife (F&W)* stream located in Lauderdale County. Based on the 2006 National Land Cover Dataset, landuse within the watershed is 72% forest and 11% pasture and cropland. Population density is very low, and less than 4% of the area is developed. As of September 1, 2012, the Department has issued no NPDES permits for 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. Bumpass Creek at BMPL-2 is a riffle-run stream located in the Transition Hills ecoregion (Figure 1). The benthic substrate consists primarily of gravel and cobble. The presence of stable substrate and riffles within the stream reach categorized the overall habitat quality of this stream 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 in comparison to least-impaired reference reaches in the same ecoregion. The final score is an average of all individual metric scores. Metric results indicated the macroinvertebrate community to be in *good* condition (Table 4).

Table 1. Summary of watershed characteristics.

| Watershed Characteristics        |                     | Tennessee River |
|----------------------------------|---------------------|-----------------|
| Basin                            |                     | Tennessee River |
| Drainage Area (mi <sup>2</sup> ) |                     | 16              |
| Ecoregion <sup>a</sup>           |                     | 65j             |
| % Landuse                        |                     |                 |
| Open water                       |                     | <1              |
| Wetland                          | Woody               | 1               |
|                                  | Emergent herbaceous | <1              |
| Forest                           | Deciduous           | 57              |
|                                  | Evergreen           | 8               |
|                                  | Mixed               | 7               |
| Shrub/scrub                      |                     | 12              |
| Grassland/herbaceous             |                     | <1              |
| Pasture/hay                      |                     | 3               |
| Cultivated crops                 |                     | 8               |
| Development                      | Open space          | 3               |
|                                  | Low intensity       | <1              |
| Population/km <sup>2b</sup>      |                     | 1               |
| # NPDES Permits                  | <b>TOTAL</b>        | 0               |

a. Transition Hills

b. 2000 US Census

Table 2. Physical characteristics of Bumpass Creek at BMPL-2, June 24, 2009.

| Physical Characteristics |                  |
|--------------------------|------------------|
| Width (ft)               | 20.0             |
| Canopy Cover             | Mostly Shaded    |
| Depth (ft)               |                  |
|                          | Riffle 1.0       |
|                          | Run 1.5          |
|                          | Pool 2.0         |
| % of Reach               |                  |
|                          | Riffle 50        |
|                          | Run 35           |
|                          | Pool 15          |
| % Substrate              |                  |
|                          | Bedrock 10       |
|                          | Boulder 1        |
|                          | Cobble 26        |
|                          | Gravel 40        |
|                          | Sand 15          |
|                          | Silt 2           |
|                          | Organic Matter 6 |

**Table 3.** Results of the habitat assessment conducted on Bumpass Creek at BMPL-2, June 24, 2009.

| Habitat Assessment              | % Maximum Score | Rating                |
|---------------------------------|-----------------|-----------------------|
| Instream Habitat Quality        | 82              | Optimal >65           |
| Sediment Deposition             | 81              | Optimal >65           |
| Sinuosity                       | 93              | Optimal >84           |
| Bank and Vegetative Stability   | 85              | Optimal >74           |
| Riparian Buffer                 | 90              | Optimal >89           |
| <b>Habitat Assessment Score</b> | <b>202</b>      |                       |
| <b>% Maximum Score</b>          | <b>84</b>       | <b>Optimal &gt;65</b> |

**Table 4.** Results of the macroinvertebrate bioassessment conducted in Bumpass Creek at BMPL-2, June 24, 2009.

| Macroinvertebrate Assessment                |            |                     |
|---|------------|---------------------|
|   | Results    | Scores              |
| <b>Taxa richness and diversity measures</b> |            | <b>(0-100)</b>      |
| # EPT taxa                                  | 28         | 100                 |
| Shannon Diversity                           | 4.68       | 92                  |
| <b>Taxonomic composition measures</b>       |            |                     |
| % EPT minus Baetidae and Hydropsychidae     | 8          | 17                  |
| % Non-insect taxa                           | 4          | 92                  |
| <b>Functional feeding group</b>             |            |                     |
| % Predator Individuals                      | 14         | 0                   |
| <b>Community tolerance</b>                  |            |                     |
| % Tolerant taxa                             | 25         | 70                  |
| <b>WMB-I Assessment Score</b>               | <b>---</b> | <b>46</b>           |
| <b>WMB-I Assessment Rating</b>              |            | <b>Good (44-72)</b> |

## WATER CHEMISTRY

Results of water chemistry are presented in Table 5. In situ measurements and water samples were collected monthly, semi-monthly (metals), or quarterly (pesticides, herbicides (atrazine), and semi-volatile organics) during March through October of 2009 to help identify any stressors to the biological communities. In situ parameters indicated that Bumpass Creek at BSMPL-2 was meeting water quality criteria for its F&W use classification. The estimated median concentration of dissolved reactive phosphorus was slightly higher than expected, based on the 90th percentile of data collected at reference reaches within the Transition Hills ecoregion (65j).

## SUMMARY

Bioassessment results indicated the macroinvertebrate community in Bumpass Creek at BMPL-2 to be in *good* condition. Habitat heterogeneity and stable substrate in the reach provide an optimal environment to support a diverse macroinvertebrate community. The median concentration of dissolved reactive phosphorus was slightly elevated as compared to data from ADEM's least-impaired reference reaches in ecoregion 65j. Monitoring should continue to ensure that water quality and biological conditions remain stable.

FOR MORE INFORMATION, CONTACT:  
Ashley Lockwood, ADEM Environmental Indicators Section  
1350 Coliseum Boulevard Montgomery, AL 36110  
(334) 260-2766 alokwood@adem.state.al.us

**Table 5.** Summary of water quality data collected March-October, 2009. 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    |
|---|-----|---------|-------|--------------------|-------|-------|
| <b>Physical</b>                                   |     |         |       |                    |       |       |
| Temperature (°C)                                  | 9   | 12.7    | 25.5  | 21.2               | 19.6  | 4.6   |
| Turbidity (NTU)                                   | 9   | 2.1     | 5.0   | 2.8                | 2.9   | 0.9   |
| <sup>J</sup> Total Dissolved Solids (mg/L)        | 8 < | 1.0     | 31.0  | 14.5               | 16.1  | 12.5  |
| Total Suspended Solids (mg/L)                     | 8 < | 0.3     | 6.0   | 2.5                | 3.0   | 2.2   |
| Specific Conductance (µmhos)                      | 9   | 21.0    | 23.0  | 22.2               | 22.1  | 0.8   |
| Hardness (mg/L)                                   | 4   | 4.4     | 6.5   | 5.5                | 5.5   | 0.9   |
| <sup>J</sup> Alkalinity (mg/L)                    | 8 < | 1.0     | 7.5   | 5.0                | 5.0   | 2.1   |
| Stream Flow (cfs)                                 | 9   | 8.9     | 47.0  | 13.2               | 22.3  | 14.9  |
| <b>Chemical</b>                                   |     |         |       |                    |       |       |
| Dissolved Oxygen (mg/L)                           | 9   | 8.2     | 10.9  | 8.7                | 9.0   | 0.9   |
| pH (su)   | 9   | 6.1     | 6.7   | 6.4                | 6.3   | 0.2   |
| <sup>B</sup> Ammonia Nitrogen (mg/L)              | 4 < | 0.006   | 0.014 | 0.003              | 0.004 | 0.002 |
| <sup>BJ</sup> Nitrate+Nitrite Nitrogen (mg/L)     | 7 < | 0.003   | 0.860 | 0.143              | 0.219 | 0.293 |
| <sup>B</sup> Total Kjeldahl Nitrogen (mg/L)       | 4 < | 0.089   | 0.310 | 0.210              | 0.194 | 0.112 |
| <sup>B</sup> Total Nitrogen (mg/L)                | 4 < | 0.186   | 0.517 | 0.364              | 0.358 | 0.139 |
| <sup>J</sup> Dissolved Reactive Phosphorus (mg/L) | 8   | 0.009   | 0.090 | 0.026 <sup>M</sup> | 0.040 | 0.035 |
| <sup>BJ</sup> Total Phosphorus (mg/L)             | 4 < | 0.005   | 0.011 | 0.006              | 0.007 | 0.004 |
| CBOD-5 (mg/L)                                     | 8 < | 1.0 <   | 2.0   | 0.5                | 0.7   | 0.2   |
| Chlorides (mg/L)                                  | 8   | 1.1     | 9.6   | 1.4                | 3.0   | 3.0   |
| Atrazine (µg/L)                                   | 2 < | 0.06 <  | 0.06  | 0.03               | 0.03  | 0.00  |
| <b>Total Metals</b>                               |     |         |       |                    |       |       |
| <sup>J</sup> Aluminum (mg/L)                      | 4 < | 0.057   | 0.060 | 0.044              | 0.044 | 0.016 |
| <sup>J</sup> Iron (mg/L)                          | 4 < | 0.017   | 0.075 | 0.034              | 0.038 | 0.030 |
| <sup>J</sup> Manganese (mg/L)                     | 4 < | 0.004   | 0.014 | 0.005              | 0.007 | 0.005 |
| <b>Dissolved Metals</b>                           |     |         |       |                    |       |       |
| <sup>J</sup> Aluminum (mg/L)                      | 4 < | 0.030   | 0.092 | 0.030              | 0.042 | 0.034 |
| Antimony (µg/L)                                   | 4 < | 0.7 <   | 6.0   | 2.0                | 1.8   | 1.4   |
| Arsenic (µg/L)                                    | 4 < | 0.4 <   | 1.6   | 0.2                | 0.4   | 0.3   |
| Cadmium (µg/L)                                    | 4 < | 2.000 < | 3.000 | 1.250              | 1.250 | 0.289 |
| Chromium (mg/L)                                   | 4 < | 0.007 < | 0.013 | 0.005              | 0.005 | 0.002 |
| Copper (mg/L)                                     | 4 < | 0.013 < | 0.200 | 0.053              | 0.053 | 0.054 |
| <sup>J</sup> Iron (mg/L)                          | 4 < | 0.014 < | 0.026 | 0.012              | 0.013 | 0.006 |
| Lead (µg/L)                                       | 4 < | 0.6 <   | 1.5   | 0.6                | 0.6   | 0.2   |
| <sup>J</sup> Manganese (mg/L)                     | 4 < | 0.004 < | 0.009 | 0.004              | 0.004 | 0.000 |
| <sup>B</sup> Mercury (µg/L)                       | 2 < | 0.080 < | 0.080 | 0.040              | 0.040 | 0.000 |
| Nickel (mg/L)                                     | 4 < | 0.004 < | 0.019 | 0.004              | 0.005 | 0.003 |
| Selenium (µg/L)                                   | 4 < | 0.4 <   | 1.5   | 0.2                | 0.3   | 0.3   |
| Silver (µg/L)                                     | 4 < | 1.000 < | 2.000 | 0.750              | 0.750 | 0.289 |
| Thallium (µg/L)                                   | 4 < | 0.4 <   | 0.5   | 0.2                | 0.2   | 0.0   |
| Zinc (mg/L)                                       | 4 < | 0.003 < | 0.060 | 0.016              | 0.016 | 0.016 |
| <b>Biological</b>                                 |     |         |       |                    |       |       |
| Chlorophyll a (ug/L)                              | 8 < | 0.53 <  | 1.00  | 0.50               | 0.58  | 0.14  |
| <sup>J</sup> Fecal Coliform (col/100 mL)          | 8   | 6       | 380   | 34                 | 91    | 130   |

B= Samples excluded due to laboratory QC concerns; N= # of samples; J=estimate; M=value > 90th percentile of all verified ecoregional reference data within ecoregion 65j