Alabama Department of Environmental Management

Use Support Assessment

Rivers and Streams Monitoring Program

# 2008 Monitoring Summary

## **Patrick Creek** at Coffee County Road 368 (31.43840/-86.11210)

### BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Patrick Creek watershed for biological and water quality monitoring as part of the 2008 Assessment of the Southeast Alabama (SE-AL) River Basins. The objectives of the SE AL Basin Assessments were to assess the biological integrity of each monitoring site and to estimate overall water quality within the SE AL basin group.

The screening assessments were conducted at stream reaches where land use estimates and non-point source information from the local Soil and Water Conservation Districts indicated a moderate or high potential for impairment from non-point sources in non-urban areas. Results of the 2004 screening-level evaluation identified Patrick Creek at PATC-1 for further monitoring during the 2008 Basin Assessment of the Southeast Alabama (SE-AL) River Basins to more fully assess biological conditions at the site, as well as the extent and cause of any impairment.

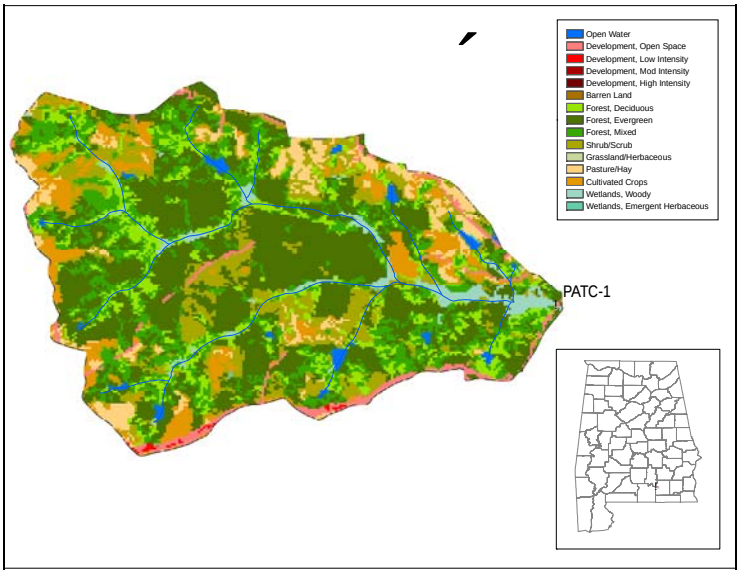


**Figure 1**. Sampling location and landuse within the Patrick Creek watershed at PATC-1.

### WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Patrick Creek is a small *Fish & Wildlife (F&W)* stream in Coffee County, northwest of Elba (Figure 1). It is a tributary of the Pea River. Based on the 2000 National Land Cover Dataset, land use within the watershed is primarily forest (65%) with some shrub/scrub. Population density is low. As of February 23, 2011, no NPDES permits have been issued in 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. Patrick Creek at PATC-1 is a low gradient glide-pool stream. Instream substrates were dominated by sand. The overall habitat score was similar to reference reaches in other areas of the coastal plain. However, lack of instream habitat was noted as a concern.

### BIOASSESSMENT RESULTS

Benthic macroinvertebrate communities were sampled using ADEM's Intensive Multi-habitat Bio-assessment methodology (WMB-I). Table 4 summarizes results of taxonomic richness, community composition, and community tolerance metrics. Data collected at PATC-1 may be used to develop an index of ADEM's WMB-I for sub/ecoregion (65d).

**Table 1**. Summary of watershed characteristics.

| Watershed Characteristics | | |
|---|---|---|
| **Basin** | | Choctawhatchee River |
| **Drainage Area (mi$^2$)** | | 9 |
| **Ecoregion**[a] | | 65d |
| **% Landuse** | | |
| Open water | | 1 |
| Wetland | Woody | 3 |
| | Emergent herbaceous | <1 |
| Forest | Deciduous | 11 |
| | Evergreen | 37 |
| | Mixed | 17 |
| Shrub/scrub | | 14 |
| Grassland/herbaceous | | <1 |
| Pasture/hay | | 6 |
| Cultivated crops | | 8 |
| Development | Open space | 3 |
| | Low intensity | <1 |
| **Population/km$^2$**[b] | | 8 |

a.Southern Hilly Gulf Coastal Plain
b.2000 US Census

**Table 2.** Physical characteristics of Patrick Creek at PATC-1, May 22, 2008.

| Physical Characteristics | | |
|---|---|---|
| **Width (ft)** | | 15 |
| **Canopy Cover** | | Mostly Shaded |
| **Depth (ft)** | | |
| | Run | 1.0 |
| | Pool | 2.2 |
| **% of Reach** | | |
| | Run | 80 |
| | Pool | 20 |
| **% Substrate** | | |
| | Clay | 3 |
| | Mud/Muck | 2 |
| | Sand | 80 |
| | Silt | 5 |
| | Organic Matter | 10 |

**Table 3.** Results of the habitat assessment conducted in Patrick Creek at PATC-1, May 22, 2008.

| Habitat Assessment | %Maximum Score |
|---|---|
| Instream Habitat Quality | 43 |
| Sediment Deposition | 59 |
| Sinuosity | 68 |
| Bank and Vegetative Stability | 58 |
| Riparian Buffer | 86 |
| **Habitat Assessment Score** | **129** |
| **% Maximum Score** | **58** |

**Table 4.** Results of the macroinvertebrate bioassessment conducted in Patrick Creek at PATC-1, May 22, 2008.

| Macroinvertebrate Assessment | |
|---|---|
| | **Results** |
| **Taxa richness measures** | |
| # EPT genera | 8 |
| **Taxonomic composition measures** | |
| % Non-insect taxa | 13 |
| % Plecoptera | 2 |
| % Dominant taxa | 18 |
| **Functional composition measures** | |
| % Predators | 34 |
| **Tolerance measures** | |
| Beck's community tolerance index | 2 |
| % Nutrient tolerant organisms | 16 |
| **WMB-I Assessment Score** | -- |

## WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. In situ measurements and water samples were collected July, September, and November 2008 to help identify any stressors to the biological communities. In situ parameters were also measured during the macroinvertebrate assessment. Patrick Creek at PATC-1 met *F&W* use classification criteria for temperature, turbidity, and dissolved oxygen. Metals concentrations of samples collected were generally below detection limits, except for Zinc, which exceeded *F&W* Aquatic Life Use Criteria on September 16, 2008. Organics and semi-volatile samples were all less than MDL.

## SUMMARY

Patrick Creek at PATC-1 was typical of other streams in the Southeastern Plains, which are generally low-gradient streams with sand substrates. Land use, road density, and population density categorized Patrick Creek among the least disturbed watersheds in the Southern Hilly Gulf Coastal Plain sub-ecoregion (65d). Habitat, bioassessment and water quality data suggest that the reach is similar to reference reaches in other areas of the coastal plain.

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**Table 5.** Summary of water quality data collected during 2008. 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 |
|---|---|---|---|---|---|---|---|---|
| **Physical** | | | | | | | | |
| Temperature (°C) | 4 | 9.1 | 25.2 | 21.9 | 19.5 | 7.2 | | |
| Turbidity (NTU) | 4 | 9.2 | 16.0 | 12.4 | 12.5 | 3.4 | | |
| Total Dissolved Solids (mg/L) | 3 | 14.0 | 44.0 | 22.0 | 26.7 | 15.5 | | |
| Total Suspended Solids (mg/L) | 3 | 1.0 | 5.0 | 2.0 | 2.7 | 2.1 | | |
| Specific Conductance (µmhos) | 4 | 50.4 | 58.4 | 52 | 53.2 | 3.7 | | |
| Hardness (mg/L) | 3 | 8.6 | 20.9 | 8.8 | 12.8 | 7.0 | | |
| Alkalinity (mg/L) | 3 | 11.2 | 16.3 | 13.2 | 13.6 | 2.6 | | |
| Stream Flow (cfs) | 4 | 1.3 | 2.0 | 1.5 | 1.6 | 0.3 | | |
| **Chemical** | | | | | | | | |
| Dissolved Oxygen (mg/L) | 4 | 7.1 | 9.6 | 7.3 | 7.8 | 1.2 | | |
| pH (su) | 4 | 6.6 | 6.8 | 6.7 | 6.7 | 0.0 | | |
| Ammonia Nitrogen (mg/L) | 3 | < 0.014 | 0.024 | 0.008 | 0.013 | 0.010 | | |
| Nitrate+Nitrite Nitrogen (mg/L) | 3 | 0.032 | 0.165 | 0.105 | 0.101 | 0.067 | | |
| Total Kjeldahl Nitrogen (mg/L) | 3 | < 0.141 | 0.308 | 0.185 | 0.188 | 0.119 | | |
| Total Nitrogen (mg/L) | 3 | < 0.102 | 0.473 | 0.290 | 0.288 | 0.185 | | |
| Dissolved Reactive Phosphorus (mg/L) | 3 | 0.010 | 0.012 | 0.010 | 0.011 | 0.001 | | |
| Total Phosphorus (mg/L) | 3 | 0.024 | 0.027 | 0.025 | 0.025 | 0.002 | | |
| CBOD-5 (mg/L) | 3 | < 1.0 | 2.7 | 0.5 | 1.2 | 1.3 | | |
| COD (mg/L) | 3 | < 2.0 | 15.1 | 9.0 | 8.4 | 7.1 | | |
| Chlorides (mg/L) | 3 | 3.8 | 5.5 | 5.1 | 4.8 | 0.9 | | |
| Atrazine (µg/L) | 2 | < 0.05 | < 0.05 | 0.02 | 0.02 | 0.00 | | |
| **Total Metals** | | | | | | | | |
| [J] Aluminum (mg/L) | 3 | 0.024 | 0.114 | 0.096 | 0.078 | 0.048 | | |
| Iron (mg/L) | 3 | 1.930 | 3.210 | 2.300 | 2.480 | 0.659 | | |
| [J] Manganese (mg/L) | 3 | 0.049 | 0.112 | 0.082 | 0.081 | 0.032 | | |
| **Dissolved Metals** | | | | | | | | |
| Aluminum (mg/L) | 3 | < 0.015 | < 0.019 | 0.01 | 0.009 | 0.001 | | |
| Antimony (µg/L) | 3 | < 2.0 | < 2.0 | 1.0 | 0.1 | 0.0 | | |
| Arsenic (µg/L) | 3 | < 1.6 | < 2.2 | 1.1 | 1.0 | 0.2 | | |
| Cadmium (mg/L) | 3 | < 0.003 | < 0.005 | 0.002 | 0.002 | 0.001 | | |
| Chromium (mg/L) | 3 | < 0.004 | < 0.013 | 0.006 | 0.005 | 0.003 | | |
| Copper (mg/L) | 3 | < 0.005 | < 0.013 | 0.006 | 0.005 | 0.002 | | |
| Iron (mg/L) | 3 | 0.401 | 0.924 | 0.483 | 0.603 | 0.281 | | |
| Lead (µg/L) | 3 | < 0.6 | < 1.5 | 0.7 | 0.6 | 0.3 | | |
| [J] Manganese (mg/L) | 3 | 0.046 | 0.106 | 0.075 | 0.076 | 0.030 | | |
| Mercury (µg/L) | 3 | < 0.0 | < 0.1 | 0.0 | 0.0 | 0.0 | | |
| [J] Nickel (mg/L) | 3 | < 0.004 | 0.015[A] | 0.003 | 0.007 | 0.007 | | 1 |
| Selenium (µg/L) | 3 | < 1.5 | < 1.6 | 0.8 | 0.8 | 0.0 | | |
| Silver (mg/L) | 3 | < 0.002 | < 0.003 | 0.001 | 0.001 | 0.000 | | |
| Thallium (µg/L) | 3 | < 0.5 | < 0.6 | 0.3 | 0.3 | 0.0 | | |
| [J] Zinc (mg/L) | 3 | < 0.003 | 0.093[A] | 0.003 | 0.033 | 0.052 | 1 | |
| **Biological** | | | | | | | | |
| Chlorophyll a (ug/L) | 3 | < 0.10 | 1.07 | 0.05 | 0.39 | 0.59 | | |
| [J] Fecal Coliform (col/100 mL) | 3 | 62 | 170 | 120 | 117 | 54 | | |

A=*F&W* aquatic life use criterion exceeded; E= # samples that exceed criterion; J=estimate; N=# samples; Q= # uncertain exceedances;